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NATIONAL DAM INSPECTION PROGRAM UPPER BRIDGEPORT DAM NDI I.D. N--ETC(U)
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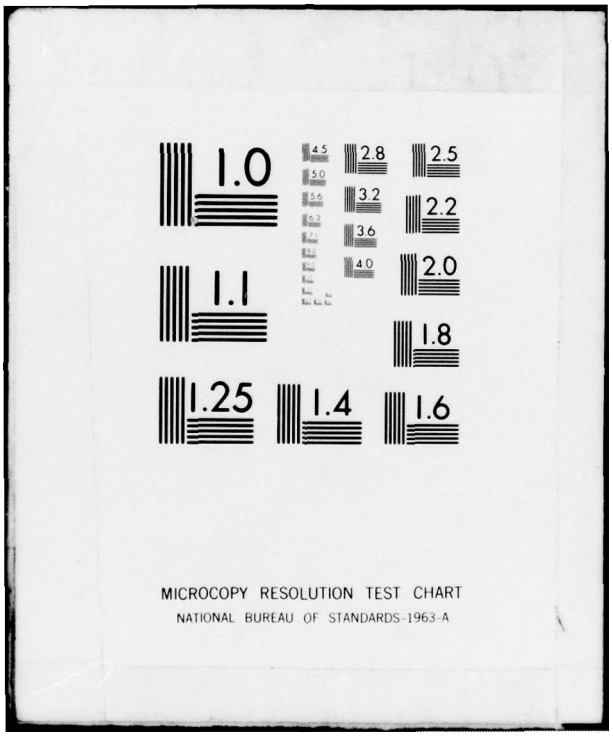
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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topograhic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

ABSTRACT

Upper Bridgeport Dam: NDI I.D. No. PA-00465

Owner:	Municipal Authority of Westmoreland County
State Located:	Pennsylvania (PennDER I.D. No. 65-5)
County Located:	Westmoreland
Stream:	Jacobs Creek
Inspection Date(s):	12 December 1978 23 April 1979
Inspection Team:	GAI Consultants, Inc. 570 Beatty Road Monroeville, Pennsylvania 15146

[contd from p. i]

Based on the visual inspection, operational history, and available engineering data, the dam is considered to be in poor condition. The facility has been essentially abandoned by the current owner and has not been in operation or maintained since 1972.

The size classification of the facility is intermediate and its hazard classification is considered to be high. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) for this facility is the Probable Maximum Flood (PMF). Results of the hydrologic and hydraulic analysis indicate that the facility can accommodate approximately 20 percent of the PMF before overtopping of the embankment occurs. Since the dam's hazard rating is high, and embankment failure would result in an increase in the potential for loss of life downstream from the dam, the present spillway system is assessed as being seriously inadequate. The facility, on the whole, is considered unsafe, but dam failure is not considered imminent. Consequently, it is recommended that the owner immediately develop an emergency warning system to notify downstream residents in the event hazardous conditions develop. Included in the plan should be provisions for around-the-clock surveillance during periods of unusually heavy precipitation.

Since the dam no longer serves its original purpose (water supply), and, in essence, has been abandoned, it is recommended that the owner immediately:

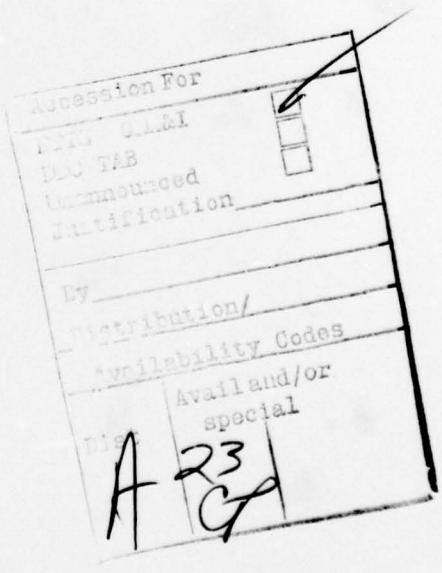
a. Reactivate or rehabilitate the drawdown facilities and subsequently drawdown and maintain the reservoir at a minimum pool level.

b. Formulate plans and initiate procedures for demolishing and removing the entire facility in accordance with the regulations of PennDER's Division of Dam Safety.

If the facility is to be reactivated for water supply or for other purposes, it is recommended that the owner:

c. Retain the services of a registered professional engineer experienced in hydraulics and hydrology to study the facility, and take appropriate measures to make the facility hydraulically adequate.

d. Retain the services of a registered professional engineer experienced in the design of earth dams to perform a detailed geotechnical evaluation of the facility and take appropriate remedial measures as dictated by the study.



GAI Consultants, Inc.

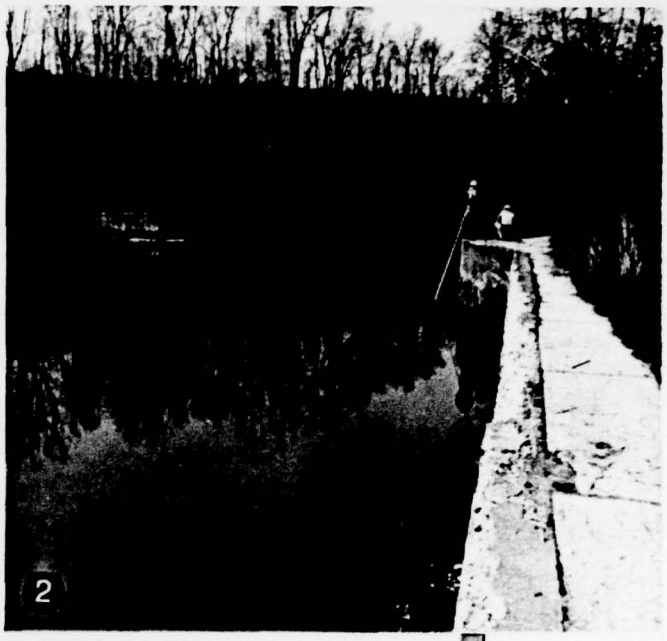
Bernard M. Mihalcin, P.E.

Date 25 July 1979

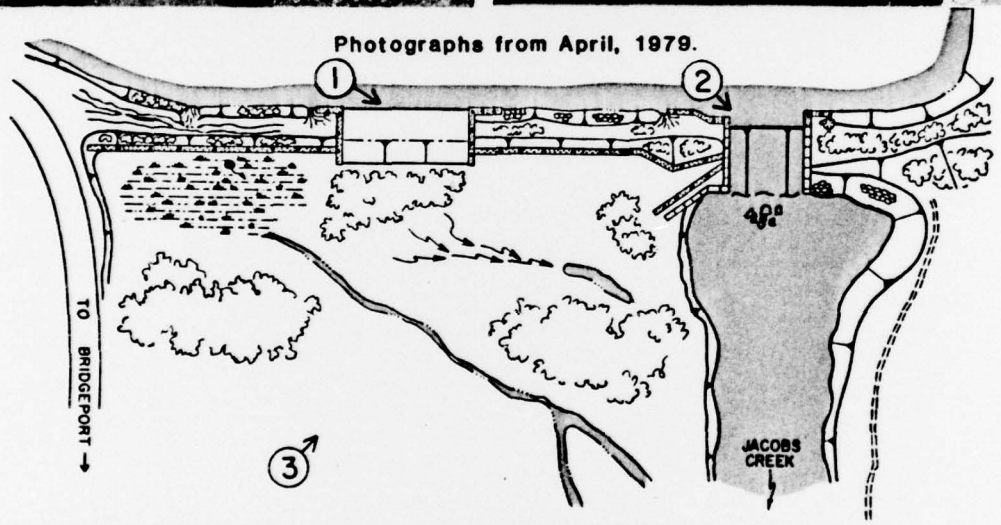
Approved by:

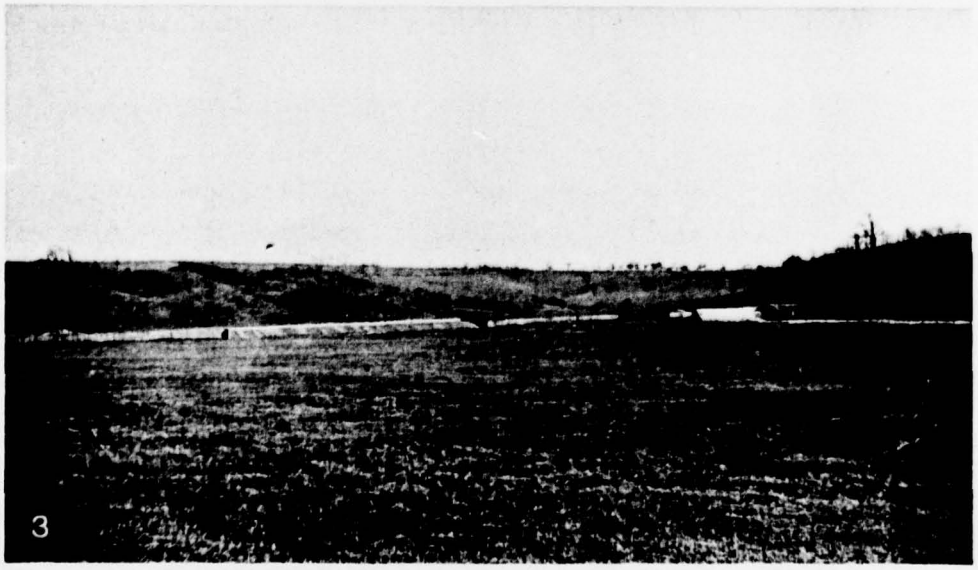
JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date 13 August 1979



Photographs from April, 1979.





Photograph from April, 1923.

OVERVIEW PHOTOGRAPH

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
UPPER BRIDGEPORT DAM
NDI# PA-465, PENNDER# 65-5

SECTION 1
GENERAL INFORMATION

1.0 Authority.

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

1.1 Purpose.

The purpose is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Upper Bridgeport Dam is an earth embankment approximately 1,020 feet long (including spillways), with a maximum height of 21 feet. The embankment is divided into three sections by two spillways (see Figure 1, Appendix F). The service spillway is a combination masonry and concrete trapezoidal-shaped weir structure with a 101-foot long crest located about 140 feet from the left abutment. The emergency spillway is a concrete broad-crested weir structure with a 250-foot crest length located about 320 feet to the left of the right abutment.

[cont'd on p. 11]

The dam has two 16-inch diameter cast iron pipe (C.I.P.) outlets, one located in each of the service spillway abutments. Each conduit is controlled by a 16-inch diameter gate valve, with the valves contained in valve pits along either wingwall (see Figures 3 and 4).

b. Location. Upper Bridgeport Dam is located on Jacobs Creek, Mount Pleasant Township, Westmoreland County, Pennsylvania, about two miles south of Mount Pleasant. The dam and reservoir are located on the Connellsville and Mount Pleasant, Pennsylvania, U.S.G.S. 7.5 minute topographic quadrangles (see Appendix G). The coordinates of the dam are N40° 8.0' and W79° 31.0'.

c. Size Classification. Intermediate (21 feet high, 1,250 acre-feet storage capacity at top of dam).

d. Hazard Classification. High (see Section 3.1.e).

e. Ownership. Municipal Authority of Westmoreland County
P. O. Box 730
Greensburg, Pennsylvania 15601

f. Purpose. Originally water supply (now defunct); presently used for unauthorized recreation.

g. Historical Data. Upper Bridgeport Dam was constructed in 1886 as a domestic and industrial water supply facility serving the communities of Mount Pleasant and Scottdale, Pennsylvania. The facility was originally owned and operated by the Mount Pleasant Water Company which was, at that time, a wholly owned subsidiary of the H. C. Frick Coke Company of Scottdale, Pennsylvania. Construction of the facility was performed by Stark Brothers, contractors from Greensburg, Pennsylvania.

The dam has been modified several times since its completion in 1886. In 1888, the embankment was raised by two feet, and it was again raised in 1894. The service spillway was modified and a concrete corewall was installed during an 1894 reconstruction. In 1906, the present emergency spillway was constructed in direct response to a flood which overtopped the dam. No recent modifications have been made to the facility under its current ownership.

In 1942, the Municipal Authority of Westmoreland County acquired the facility and immediately established it, along with the Lower Bridgeport Dam, as an integral part of their water supply system. The facility remained in operation until 1972 when the owner began to fulfill the water demands of the local area via their Youghiogheny system.

1.3 Pertinent Data.

a. Drainage Area (square miles). 28.9 (local)
31.5 (total)

b. Discharge at Dam Site. Discharge records are not available.

c. Elevation (feet above mean sea level). The following elevations were obtained through field measurements that

were based on the elevation of the service spillway crest at 1053.5 feet.

Top of Dam	1059 (measured low spot along embankment)
Maximum Pool Design	Not known
Maximum Pool of Record	Not known
Service Spillway Crest	1053.5
Emergency Spillway Crest	1056.6
Normal Pool	1053.5
Upstream Outlet Invert	1040
Downstream Outlet Invert	1038
Streambed at Dam Centerline	1039
Streambed at Emergency Spillway	1038
Maximum Tailwater	Not known

d. Reservoir Length (miles).

Top of Dam	2.3
Normal Pool	1.0

e. Storage (acre-feet).

Top of Dam	1250
Service Spillway Crest	530
Emergency Spillway Crest	870

f. Reservoir Surface (acres).

Top of Dam	180
Service Spillway Crest	80
Emergency Spillway Crest	140

g. Dam.

Type	Earth embankment
Length	1020 feet (field measured; includes service and emergency spillways)
Height	Maximum field measured section ≈ 21 feet.
Top Width	Varies; 15 to 25 feet to the right of the service spillway and 70 to 140 feet to the left of the service spillway.

	Zoning	Homogeneous earth with concrete corewall.
	Impervious Core	A concrete core wall, according to PennDER records, was installed in 1894. No other information pertaining to its design or construction are available.
	Cutoff	According to available information the embankment is founded on clay; however, there is no specific mention of a cutoff.
	Grout Curtain	None indicated.
h.	Diversion Canal.	None
i.	Outlet Conduit.	
	Type	Two 16-inch diameter cast iron outlets, one located in each of the abutments of the service spillway.
	Length	Each outlet pipe is 40 feet, inlet to gate valve control. Beyond the gate valves, discharge is channeled into masonry tunnels and eventually released at the downstream bases of the wingwalls of the service spillway.
	Closure	Discharge through the outlets is controlled by 16-inch diameter gate valves housed at the bases

		of two separate valve pits located on either side of the service spillway crest.
	Access	The valve pits are accessible from the embankment crest.
j.	Spillways.	
	Types	Service: Concrete faced stone masonry, trapezoidal-shaped weir structure, with a cut stone coped crest. Emergency: concrete broad-crested weir structure.
	Crest Lengths	Service: 101 feet Emergency: 250 feet
	Upstream Channels	Not applicable
	Downstream Channels	Service: the service spillway discharges flow directly into the pool formed by the Lower Bridgeport Dam. Emergency: the emergency spillway discharges into the heavily wooded area to the right of the Lower Bridgeport Reservoir, and eventually into the lower reservoir several hundred feet downstream from the Upper Bridgeport embankment.
k.	Regulating Outlets.	See "Outlet Conduit" above.

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Design Data Availability and Sources. No design data, calculations, or reports are available concerning any aspect of this facility. Design features, presented below, are derived from information and correspondence contained in PennDER files. Included in the files were drawings, dated photographs, and state inspection reports.

b. Design Features.

1. Embankment. The embankment, as shown on Figure 1, was constructed of earth atop a clay foundation. No records of compaction procedures or construction techniques are available. A concrete corewall was installed in 1894 which reportedly extends from the right abutment to the left wingwall of the service spillway, a length of about 800 feet. No outer corewall details are available. Cross-sectional dimensions, specifically, heights, crest widths, and slope angles vary significantly along the embankment.

2. Appurtenant Structures.

a. Service Spillway. The service spillway is a concrete faced cut stone masonry, trapezoidal-shaped weir structure located approximately 140 feet from the left abutment (see Photograph 4). The overflow section is 101 feet long and 6.7 feet below the top of the wingwall (5.5 feet below the low spot of the embankment).

b. Emergency Spillway. The emergency spillway is a concrete broad-crested weir structure (see Photograph 2) located about 320 feet from the right abutment, and approximately 215 feet to the right of the service spillway. The crest measures 250 feet across, and is about 3 feet deep (2.4 feet below the low spot of the embankment).

c. Outlet Conduits. The dam was designed with two 16-inch diameter C.I.P. outlet conduits, one located in each of the abutments of the service spillway (see Figure 4). The conduits are controlled by 16-inch diameter gate valves located at the bases of valve pits built into the spillway wingwalls. The inlet ends of the conduits are apparently equipped with trash screens. The outlet ends terminate below the surface of the water in the reservoir formed by the Lower Bridgeport Dam.

c. Design Data and Procedures. No specific design data are available for any aspect of this facility.

2.2 Construction Records.

No construction records are available.

2.3 Operating Records.

No records of operation are available.

2.4 Other Investigations.

Aside from periodic Pennsylvania State Inspection Reports contained in PennDER files, no records of other investigations are available.

2.5 Evaluation.

No formal engineering data are available; however, sufficient information, in the form of drawings and historical records, are available to make a reasonable Phase I assessment of the facility.

SECTION 3
VISUAL INSPECTION

3.1 Observations.

a. General. The general appearance of the structure, based on the visual inspection, suggests that it is in poor condition.

b. Embankment. Observations made during the visual inspection revealed the embankment to be in poor condition. The embankment is heavily overgrown with trees as well as thick brush (see Photographs 1 and 3). The crest is extensively rutted between the emergency spillway and right abutment where vehicular access is available (see Photograph 1). Several of the ruts were measured to be in excess of 12 inches deep. Several eroded areas, completely void of riprap protection, were observed along the upstream slope. The exposed concrete retaining wall, which defines the downstream slope along most of the embankment, displays numerous cracks and spalls, but overall, was considered to be in fair condition (see Photograph 6). The downstream toe area was found to be heavily wooded (see Photograph 7). Seepage was observed in the swamp-like area between the right abutment and emergency spillway. A sinkhole, approximately 3 feet in diameter and 3 feet deep, was observed several feet to the left of the service spillway (see Figure 1). In general, the embankment, as observed during the inspection, displays numerous signs of deterioration and a lack of maintenance.

c. Appurtenant Structures.

1. Service Spillway. Based on the visual inspection, the service spillway is considered to be in fair condition. The block masonry and concrete structure is well aligned along the crest and at both wingwalls. Extensive cracking and spalling were, however, observed along concrete portions of both wingwalls upstream from the crest (see Photograph 9).

2. Emergency Spillway. The emergency spillway is in a poor condition, characterized by extensive spalling, cracking, and overall concrete deterioration (see Photographs 2 and 8).

3. Outlet Conduits. The intakes and outlets of the outlet conduits are submerged by design and, consequently, were not observed by the inspection team. The valve pit at

the right wingwall was covered with a steel door and locked, making it inaccessible. The valve pit at the left wingwall was not covered; however, the valve was equally unobservable due to several feet of debris within the pit. The owner's representative did not know whether or not either conduit valve was operable, as neither has been operated since at least 1972.

d. Reservoir Area. The reservoir is surrounded by moderate to steep slopes comprised of pastureland and moderate to thickly wooded areas. No evidence of slope distress was observed in the surrounding area.

e. Downstream Area. Discharge from both spillways of Upper Bridgeport Dam flows into the pool formed by the Lower Bridgeport Dam. The lower dam is located approximately 2,400 feet downstream from the upper dam (see Photographs 10 and 12). The southern (left) shore of the Lower Bridgeport Reservoir is lined by approximately six homes (see Photograph 11) which could possibly be affected by an embankment breach of the Upper Bridgeport Dam. Another seven structures are located along the northern (right) bank of the lower reservoir at somewhat higher elevations. In addition, the bulk of the community of Bridgeport is located along the right bank of Jacobs Creek downstream from the Lower Bridgeport Dam. Thus, the hazard classification of the facility is considered to be "high".

3.2 Evaluation.

The overall appearance of the facility indicates it to be in poor condition. The facility is minimally maintained and has, in essence, been abandoned. In accordance with PennDER, Division of Dam Safety regulations, the facility should be drained and the embankment dismantled.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Normal Operational Procedures.

The facility has not been in active operation since 1972. As a result, there are no formal operating procedures associated with it. Presently, excess inflow is discharged over the service spillway and into the pool formed by the Lower Bridgeport Dam. If the reservoir level reaches elevation 1056.6, or 3.1 feet above the service spillway crest, the emergency spillway will discharge excess inflow into the Lower Bridgeport Reservoir in tandem with the service spillway. The outlet conduits were last operated in 1972.

4.2 Maintenance of Dam.

Since the facility was phased out of operation in 1972, no formal maintenance has been routinely performed.

4.3 Maintenance of Operating Facilities.

See "Maintenance of Dam" above.

4.4 Warning System.

No formal warning system is in effect.

4.5 Evaluation.

No formal operational or maintenance procedures are available relative to any aspect of the facility. The facility was phased out of active operation in 1972, and is now defunct. Additionally, there is no formal warning system in effect.

SECTION 5
HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

No design data, calculations, or reports are available. Information relative to the design of the facility is limited to that which can be inferred from the several drawings, photographs, and state inspection reports available in PennDER files.

5.2 Experience Data.

No records of spillway and/or outlet conduit discharges are available. Data contained in PennDER files indicates that the emergency spillway was constructed in 1906 in direct reaction to a flood which overtopped the embankment. Photographs dated 1941 indicate damage to the emergency spillway, presumably after a significant discharge.

5.3 Visual Observations.

On the date of inspection no conditions were observed that would indicate the service spillway would not perform satisfactorily during a flood event. The discharge capacity of the emergency spillway, on the other hand, may be reduced due to the dense overgrowth immediately beyond the downstream embankment toe (see Photograph 7). The present operability of the outlet works is questionable.

5.4 Method of Analysis.

The facility has been analyzed in accordance with the procedures and guidelines established by the U. S. Army, Corps of Engineers, Baltimore District, for Phase I hydrologic and hydraulic evaluations. The analysis has been performed utilizing a modified version of the HEC-1 program developed by the U. S. Army, Corps of Engineers, Hydrologic Engineering Center, Davis, California. Analytical capabilities of the program are briefly outlined in the preface contained in Appendix C.

5.5 Summary of Analysis.

a. Spillway Design Flood (SDF). In accordance with procedures and guidelines contained in the National Guidelines

for Safety Inspection of Dams for Phase I Investigations, the Spillway Design Flood (SDF) for Upper Bridgeport Dam is the PMF. That is, based on the relative size (intermediate) and hazard potential (high) of Upper Bridgeport Dam, the facility is required to have sufficient spillway and storage capabilities to safely discharge the PMF without embankment overtopping.

b. Results of Analysis. Upper Bridgeport Dam was analyzed under assumed normal operating conditions. That is, the Upper Bridgeport Dam reservoir was initially at its normal pool or service spillway elevation of approximately 1053.5 feet (MSL), with the low-level blowoff lines closed. The service spillway of the facility is composed of a combination masonry and concrete trapezoidal-shaped weir structure which discharges directly into the Lower Bridgeport Dam reservoir. The emergency spillway of the facility is composed of a concrete broad-crested weir structure which discharges into the woods that are located directly beyond the embankment toe.

The PA-657 Dam, located about 9.0 miles upstream from the Upper Bridgeport Dam, was also evaluated in this analysis to assess its effects on the Upper Bridgeport Dam. It too was investigated under near normal operating conditions. That is, the PA-657 Dam reservoir was initially at its normal or recreation pool elevation of 1827.5 feet (MSL) with the service spillway (drop-inlet structure) assumed to be non-functional for the purpose of analysis. Design information concerning the PA-657 Dam reservoir's elevation-storage relationship was available and used in the evaluation. Design information was also available regarding the elevation-discharge relationship of the emergency spillway, but this data was felt to be too conservative for analysis and was not used. The emergency spillway is a vegetated chute channel with a flat, vegetated, critical flow control crest.

Finally, the effects of the Lower Bridgeport Dam on the Upper Bridgeport facility were considered via the computation of a tailwater curve, since the Lower Bridgeport Dam's reservoir extends to the toe of the upper dam's service spillway. All downstream channel routing was done under the assumption that the stream was dry prior to the inflow of the dam outflows. All pertinent engineering calculations relative to the evaluation of Upper Bridgeport Dam are provided in Appendix C, while calculations relative to the evaluation of the upstream PA-657 Dam are provided in Appendix C-1. (Lower Bridgeport Dam computations are contained on Sheets 16 through 22 cf Appendix C.)

Overtopping analysis (using the Modified HEC-1 computer program) indicated that the discharge/storage capacity of Upper Bridgeport Dam can accommodate only about 20 percent of the PMF (the SDF) prior to the overtopping of its embankment, while the discharge/storage capacity of PA-657 Dam can accommodate the full PMF (Appendix C, Summary Input/Output Sheets, Sheets S and R). The low top of embankment of Upper Bridgeport Dam was inundated by depths of water of 1.1 feet under 1/2 PMF conditions, and 5.0 feet under full PMF conditions. Therefore, since the SDF of each of these facilities is the PMF, only the Upper Bridgeport Dam has a high potential for overtopping, and thus, for breaching under floods of much less than SDF magnitude.

Since the Upper Bridgeport Dam facility cannot safely handle a flood of at least 1/2 PMF magnitude, the possibility of embankment failure under floods of 1/2 PMF intensity or less was investigated (in accordance with ETL-1110-2-234). Several feasible alternatives were analyzed, since it is difficult, if not impossible, to determine exactly how or if a specific dam will fail. The major concern of the breaching evaluations is with the impact of the various breach discharges on increasing downstream water surface elevations above those to be expected if breaching did not occur.

The Modified HEC-1 computer program was used for the breaching analysis with the assumption that the breaching of a dam would begin once its reservoir level reached the low top of dam elevation.

Two sets of breach geometry were analyzed for the Upper Bridgeport Dam for each of two failure times (Appendix C, Sheet 23). The two sets of breach sections chosen were considered to be the minimum and maximum probable failure sections. The two failure times (total time for each breach section to reach its final dimensions) under which the two breach sections were evaluated were assumed to be a moderately rapid time (0.75 hours) and a prolonged time (4.0 hours), so that the possible upper and lower limits of this most sensitive variable might be examined. In addition, an average or more probable set of breach conditions was analyzed, with a failure time of 1.5 hours.

The Upper Bridgeport Dam peak breach outflows (resulting from a 0.22 PMF overtopping) ranged from about 8020 cfs for the minimum section-prolonged fail time scheme, to about 18550 for the maximum section-minimum fail time scheme (Summary Input/Output Sheets, Sheet BB). The outflow for the average breach condition was about 11890 cfs compared to the non-breach 0.22 PMF peak facility outflow of about 8180 cfs (Summary Input/Output Sheets, Sheet S). The water surface elevation corresponding to the non-breach 0.22 PMF

peak discharge at a section (Section 7) located 550 feet downstream from the dam was approximately 1053.1 feet (MSL) and approximately 1051.3 feet (MSL) at a section (Section 8) located 2,400 feet downstream from the dam (Summary Input/Output Sheets, Sheet S). The water surface elevations corresponding to the average condition peak breach outflow at the two above-mentioned downstream sections were about 1054.5 feet (MSL) and 1052.6 feet (MSL), respectively (Summary Input/Output Sheets, Sheet BB). The approximate elevation of the first house at Section 7, as well as of the other structures which line the left bank of the Lower Bridgeport Dam Reservoir is 1050 feet (MSL). The approximate elevation of the structure at Section 8 (excluding the abandoned building which abuts the lower dam) as well as of the other structures which line the right bank of the Lower Bridgeport Dam reservoir is 1053 feet (MSL), as determined by field measurement and observation. Therefore, the increase in the water surface at Section 7 caused by the failure of Upper Bridgeport Dam was about 1.4 feet, with the breach water surface above the damage levels of the structures along the left bank of the lower reservoir. The increase in the water surface at Section 8, caused by the failure of the dam, was about 1.3 feet with the approximate breach water surface just below the damage levels of the structures along the right bank of the lower reservoir. Although the houses along the left bank area would probably be somewhat damaged even if the dam did not fail, the water surface increases resulting from dam breaching could conceivably cause much more significant damage to the structures, if not only the increase in the height of the floodwave, but also the increase in the momentum of the larger and probably swifter moving volume of water was considered.

Analysis of embankment breaching under 1/2 PMF base conditions indicated that failure of the dam during a flood of such magnitude would probably not increase the damage to downstream structures (Appendix C, Sheets 25 and 26). However, the analysis indicated that there is a flood between the 0.22 PMF and the 1/2 PMF under which dam failure would result in increased damage to the residences on the right bank of the Lower Reservoir. Therefore, the failure of Upper Bridgeport Dam caused by floods of less than 1/2 PMF magnitude is quite possible, and will most probably lead to increased property damage and loss of life in the downstream community.

5.6 Spillway Adequacy.

As presented previously, under existing conditions Upper Bridgeport Dam can accommodate only about 20 percent

of the PMF (the SDF) prior to overtopping of its embankment. Should a 0.22 PMF or somewhat larger event occur, the dam will be overtopped and will possibly fail, endangering many residences in the immediate downstream area. Therefore, the spillway system of Upper Bridgeport Dam is considered to be seriously inadequate.

SECTION 6
EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Embankment. The conditions observed during the field inspection suggest the embankment is in poor condition and suffers from a general lack of maintenance and care. This condition is considered serious in light of the age and hazard classification of the facility.

Specific deficiencies which are related to a lack of maintenance include: 1) heavy vegetation and overgrowth along the embankment and downstream toe area; 2) deep rutting of the embankment crest between the emergency spillway and right abutment; and 3) several eroded areas along the upstream face that are completely void of riprap protection. The above items are undesirable, and over the long term, could present a serious threat to embankment stability.

Other deficiencies include the: 1) 3-foot deep sinkhole located several feet to the left of the service spillway; and 2) the seepage and swamp-like condition along the downstream toe between the emergency spillway and right abutment indicating possible structural deficiencies which may pose a threat to embankment stability under flood conditions.

b. Appurtenant Structures.

1. Service Spillway. The service spillway is in fair condition. Its general appearance suggests it to be structurally stable. The major deficiency associated with the structure is its extensively cracked and badly spalled concrete wingwalls.

2. Emergency Spillway. The emergency spillway is in poor condition. The concrete structure is badly deteriorated as evidenced by extensive spalling, scaling and deep structural cracking. Its structural integrity and overall stability under high flows is questionable.

3. Outlet Conduits. The outlet conduits were last operated in 1972, and their present operability is questionable.

6.2 Design and Construction Techniques.

No information is available that details the methods of design and/or construction.

6.3 Past Performance.

Correspondence contained in PennDER files indicate that the facility was constructed in 1886. In 1906, the embankment was overtopped which prompted the construction of the present emergency spillway. Two photographs contained in PennDER files indicate that in 1941, the emergency spillway suffered a partial collapse from apparent settlement (possibly internal piping) of the supporting soil. Otherwise, since 1906, the facility has apparently performed adequately. However, no flood records are available.

6.4 Seismic Stability.

The dam is located within Seismic Zone No. 1 and may be subject to minor earthquake induced dynamic forces. Due to its relatively small cross-section, it is believed the embankment can withstand the expected minor earthquake induced forces. However, no calculations or investigations were performed to confirm this opinion.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. Visual observations indicate the structure to be in poor condition. The facility, which was originally designed to serve the water supply needs of nearby communities, has not been in operation since 1972. Its physical condition has deteriorated steadily over the last decade as it has essentially been abandoned by the present owner.

The general lack of maintenance has contributed to many of the deficiencies presently associated with the facility including: 1) an overgrown embankment and downstream areas; 2) rutted crest; 3) bare unprotected areas along the upstream slope; 4) severely deteriorated concrete; 5) questionable operability of the outlet conduits; and 6) an apparent sinkhole and other low areas along the crest.

Hydrologic and hydraulic calculations indicate the spillways can accommodate approximately 20 percent of the Probable Maximum Flood (PMF) before overtopping of the embankment occurs. As the facility's hazard rating is high, the present spillway system is assessed as being seriously inadequate and the facility is considered to be unsafe, non-emergency.

b. Adequacy of Information. The available data is considered sufficient to make a reasonable Phase I assessment of the facility.

c. Urgency. Because of the seriously inadequate spillway system, a formal warning system should be implemented immediately. It is further recommended that the actions required by the recommendations listed in Section 7.2 be promptly initiated.

d. Necessity for Additional Investigations. No additional investigations are recommended at this time.

7.2 Recommendations/Remedial Measures.

Because of the seriously inadequate spillway system, the facility is considered unsafe. Embankment failure is not considered imminent; however, failure could significantly increase the hazard to downstream communities. As a consequence, it is recommended that the owner immediately develop a warning system to notify downstream residents

should hazardous conditions develop. Included in the plan should be provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

In light of the fact that the dam no longer serves its original purpose, and has, in essence, been abandoned, it is recommended that the owner immediately:

a. Reactivate or rehabilitate the drawdown facilities and subsequently drawdown and maintain the reservoir at a minimum pool level.

b. Formulate plans and initiate procedures for demolishing and removing the entire facility in accordance with the regulations of PennDER's, Division of Dam Safety.

If the facility is to be reactivated for water supply or for other purposes, it is recommended that the owner:

c. Retain the services of a registered professional engineer experienced in hydraulics and hydrology to study the facility, and take appropriate measures to make the facility hydraulically adequate.

d. Retain the services of a registered professional engineer experienced in the design of earth dams to perform a detailed geotechnical evaluation of the facility, and take appropriate remedial measures as dictated by the study.

APPENDIX A

CHECK LIST - ENGINEERING DATA

NAME OF DAM: Upper Bridgeport Dam

NDI#: PA-465 PENNDER# : 65-5

CHECK LIST
ENGINEERING DATA
PHASE I

ITEM	REMARKS NDI# PA - 465
PERSONS INTERVIEWED AND TITLE	Ken Baker - Engineer, Municipal Authority of Westmoreland County Paul Mance - Assistant Superintendent of Scottsdale Division
REGIONAL VICINITY MAP	Dam and reservoir contained on Connellsville and Mount Pleasant, PA., 7.5 minute U.S.G.S topographic quadrangles (see Appendix G).
CONSTRUCTION HISTORY	Good historical report in PennDER files, dated April 7, 1915. Dam built in 1886 for Mount Pleasant Water Company (owned by H. C. Frick Coke Company) Eventually purchased by Westmoreland Authority in 1942 or 1943.
AVAILABLE DRAWINGS from from	Owner: 1971 Land Survey PennDER: Four (4) drawings showing plans of dam and spillways with few details.
TYPICAL DAM SECTIONS	No drawings. Described in 1915 PennDER report.
OUTLETS: PLAN DETAILS DISCHARGE RATINGS	See Figure 4, Appendix F.

ITEM	REMARKS NDI# PA - 465
SPILLWAY: PLAN SECTION DETAILS	See Figures 3 through 6, Appendix F.
OPERATING EQUIPMENT PLANS AND DETAILS	See Figure 4, Appendix F.
DESIGN REPORTS	None
GEOLOGY REPORTS	None
DESIGN COMPUTATIONS: HYDROLOGY AND HYDRAULICS STABILITY ANALYSES SEEPAGE ANALYSES	None
MATERIAL INVESTIGATIONS: BORING RECORDS LABORATORY TESTING FIELD TESTING	None

ITEM	REMARKS NDI# PA - 465
BORROW SOURCES	Not known. Probably from within reservoir.
POST CONSTRUCTION DAM SURVEYS	1917 property survey conducted, available from PennDER files.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None by present owner.
HIGH POOL RECORDS	PennDER files infer emergency spillway passed flow in 1941. Representatives of present owner cannot recall any flow over emergency spillway (since 1942).
MONITORING SYSTEMS	None
MODIFICATIONS	None since acquired by Westmoreland Authority. Several modifications described in 1915 PennDER report include renovation of service spillway and construction of emergency spillway in 1916.

ITEM	REMARKS NDI# PA - 465
PRIOR ACCIDENTS OR FAILURES	None during use by present owner. PennDER files indicate: a) Overtopped in 1906 - emergency spillway added b) Downstream face of emergency spillway lost support and collapsed in 1941 - apparently repaired.
MAINTENANCE: RECORDS MANUAL	None
OPERATION: RECORDS MANUAL	None
OPERATIONAL PROCEDURES	Currently out of operation. Previously, right drain (16" diameter outlet) was used to supplement water supply to Lower Bridgeport Dam where supply was drawn off and filtered. Valve was operated manually with 20-foot long key.
WARNING SYSTEM AND/OR COMMUNICATION FACILITIES	None - No observers during flood conditions.
MISCELLANEOUS	Water supply now taken from Youghiogheny system.

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

NDI ID # PA-00465
PENN DER ID # 65-5

SIZE OF DRAINAGE AREA: 28.9 square miles (local); 31.5 square miles (total)

ELEVATION TOP NORMAL POOL: 1053.5 STORAGE CAPACITY: 530 acre-feet

ELEVATION TOP FLOOD CONTROL POOL: - STORAGE CAPACITY: -

ELEVATION MAXIMUM DESIGN POOL: - STORAGE CAPACITY: -

ELEVATION TOP DAM: 1059.0 (measured low point) STORAGE CAPACITY: 1250 acre-feet

SPILLWAY DATA

CREST ELEVATION: 1053.5 (service); 1056.6 (emergency)

TYPE: service: concrete and masonry, trapezoidal-shaped weir structure; emergency: concrete, broad-crested weir

WIDTH: 101 feet (service); 250 feet (emergency)

LENGTH: N/A

SPILLOVER LOCATION: service: about 140 feet right of left abutment; emergency: about 320 feet left of right abutment

NUMBER AND TYPE OF GATES: Neither spillway is gated

OUTLET WORKS

TYPE: two 16-inch diameter CIP outlets

LOCATION: one outlet located in each of the abutments of the service spillway

ENTRANCE INVERTS: approximately 1040 feet (estimated)

EXIT INVERTS: approximately 1038 feet (estimated)

EMERGENCY DRAWDOWN FACILITIES: Each 16-inch pipe is valved within pits along either spillway wingwall. Operability of the valves is questionable.

HYDROMETEOROLOGICAL GAGES

TYPE: None

LOCATION: -

RECORDS: -

MAXIMUM NON-DAMAGING DISCHARGE: Not known

APPENDIX B .

CHECK LIST - VISUAL INSPECTION

CHECK LIST
VISUAL INSPECTION
PHASE 1

NAME OF DAM Upper Bridgeport Dam STATE Pennsylvania COUNTY Westmoreland

NDI# PA - 465 PENNDER# 65-5

TYPE OF DAM earth SIZE intermediate HAZARD CATAGORY high

DATE(S) INSPECTION 12 December 1978 WEATHER overcast TEMPERATURE 30° @ 9:00AM.

POOL ELEVATION AT TIME OF INSPECTION 1053.5 M.S.L.

TAILWATER AT TIME OF INSPECTION 1042.5 M.S.L.

INSPECTION PERSONNEL	OWNER REPRESENTATIVES	OTHERS
B. M. Mihalcin	Ken Baker	
D. L. Bonk	Paul Mance	
W. J. Veon		
S. R. Michalski		

RECORDED BY D. L. Bonk

ITEM	OBSERVATIONS AND/OR REMARKS NDI# PA - 465
SURFACE CRACKS	None observed. Deep and extensive rutting is evident across the embankment crest between the right abutment and the emergency spillway.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	1) Upstream face approximately 75 feet from the right abutment. 10 to 15 feet of this area is unprotected and without riprap, and it is evident that there has been a loss of soil. 2) Behind left wingwall of service spillway (nearest left abutment). 3) Slight erosion observed behind right wingwall of emergency spillway.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Horizontal alignment generally conforms to available drawings. Vertical alignment, as indicated by field measurements, is irregular with apparent differential settlements in excess of 1-foot. The lowest area is located at the right abutment.
RIPRAP FAILURES	Hand-placed slabby sandstones provide riprap protection along the upstream face of the embankment. The riprap extends across the entire length of the embankment and approximately 3 feet above pool level. Several areas (near the right abutment and near the spillway wingwalls) are lacking any riprap protection and display signs of erosion.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good condition.

ITEM	OBSERVATIONS AND/OR REMARKS NDI# PA - 465
DAMP AREAS IRREGULAR VEGETATION (LUSH OR DEAD PLANTS)	Swamp-like area immediately downstream of emergency spillway and right portion of embankment. (see Seepage below)
ANY NOTICEABLE SEEPAGE	None through face of embankment. However, area below and to right of emergency spillway is swamp-like with several concentrated seeps as close as 5 feet to the downstream retaining wall. This could be significant as there is little head that is causing flow.
STAFF GAGE AND RECORDER	None
DRAINS	Weep holes observed in concrete wall along downstream face of embankment. All were apparently clear; however none were discharging.

OUTLET WORKS

ITEM	OBSERVATIONS AND/OR REMARKS NDI# PA - 465
INTAKE STRUCTURE	Submerged - not observed.
OUTLET CONDUIT (CRACKING AND SPALLING OF CONCRETE SURFACES)	Submerged - not observed.
OUTLET STRUCTURE	Separate identical outlet conduits are located on either side of the service spillway near the left abutment. Control valves are located at the base of masonry chambers located several feet to each side of the spillway wingwalls.
OUTLET CHANNEL	see Sheet 6 of 8 - "Discharge Channel"
GATE(S) AND OPERATIONAL EQUIPMENT	Left conduit valve is covered with debris and the chamber is unprotected. The right chamber was covered with a steel plate that was locked and bolted in place. The owner did not have a key to allow the field team to observe the valve. The present operability of the outlet works is not known. The dam and reservoir no longer serve a useful purpose, and consequently, there has been no reason to operate the outlets. Reportedly, the outlet
	conduits have not been operated since at least 1972, although even this date is in doubt.

ITEM	OBSERVATIONS AND/OR REMARKS NDI# PA - 465
TYPE AND CONDITION	Concrete broad-crested weir structure in poor condition.
APPROACH CHANNEL	No actual channel. However, flow could be obstructed by brush, trees, and tall grass observed along upstream side of spillway structure.
SPILLWAY CHANNEL AND SIDEWALLS	Spillway crest severely deteriorated. Sidewalls show severe cracking.
STILLING BASIN PLUNGE POOL	None
DISCHARGE CHANNEL	Heavily overgrown with trees and brush.
BRIDGE AND PIERS	None
EMERGENCY GATES	None

ITEM	OBSERVATIONS AND/OR REMARKS NDI# PA - 465
TYPE AND CONDITION	Concrete and cut stone trapezoidal-shaped weir structure. Crest is 5-foot wide stone coping. Upstream walls are concrete in fair to poor condition. Crest section in good condition.
APPROACH CHANNEL	N/A
OUTLET STRUCTURE	N/A
DISCHARGE CHANNEL	Flows discharged into rock-lined stilling basin and which is contained within upstream portion of Lower Bridgeport Reservoir.

ITEM	OBSERVATIONS AND/OR REMARKS NDI# PA - 465
MONUMENTATION SURVEYS	None observed.
OBSERVATION WELLS	None observed.
WEIRS	None observed.
PIEZOMETERS	None observed.
OTHERS	

ITEM	OBSERVATIONS AND/OR REMARKS NDI# PA - 465
SLOPES: RESERVOIR	Moderate to steep. Primarily thickly wooded (75 percent) with some pasturelands (25 percent). No instability noted around reservoir.
SEDIMENTATION	None observed.
DOWNSTREAM CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.)	Unobstructed reservoir pool to Lower Bridgeport Dam which is located about 2,400 feet downstream. Highway bridge crosses Jacobs Creek about 500 feet further downstream.
SLOPES: CHANNEL VALLEY	Downstream channel slope is gentle. Downstream valley slopes are quite variable. A broad, flat floodplain occurs just downstream from the nearest residential center (see below).
APPROXIMATE NUMBER OF HOMES AND POPULATION	Approximately 6 homes are located along the southern (left) shore of the Lower Bridgeport Reservoir which could be affected by high flows (estimated population of 20). Another seven structures are located along the higher northern (right) shore of the Lower Reservoir. The remainder of the community of Bridgeport is located along the northern bank of Jacobs Creek, downstream from the Lower Bridgeport Dam.

APPENDIX C

HYDRAULICS/HYDROLOGY

PREFACE

The modified HEC-1 program is capable of performing two basic types of hydrologic analyses: (1) the evaluation of the overtopping potential of the dam; and (2) the estimation of the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. Briefly, the computational procedures typically used in the dam overtopping analysis are as follows:

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.

c. Routing of the outflow hydrograph(s) from the reservoir to desired downstream locations. The results provide the peak discharge(s), time(s) of the peak discharge(s), and the maximum stage(s) of each routed hydrograph at the downstream end of each reach.

The evaluation of the hydrologic-hydraulic consequences resulting from an assumed structural failure (breach) of the dam is typically performed as outlined below.

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir.

c. Development of a failure hydrograph(s) based on specific breach criteria and normal reservoir outflow.

d. Routing of the failure hydrograph(s) to desired downstream locations. The results provide estimates of the peak discharge(s), time(s) to peak, and maximum water surface elevation(s) of the failure hydrograph(s) for each location.

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

BY WJV DATE 4-24-79 PROJ. NO. 79-617-465

CHKD. BY DLB DATE 6-4-79 SHEET NO. 1 OF 26

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DAM STATISTICS

HEIGHT OF DAM ≈ 21 FT (FIELD MEASURED)
(FROM BASE OF SPILLWAY TO LOW POINT OF EMBANKMENT)

MAXIMUM POOL STORAGE CAPACITY ≈ 1250 AC-FT (SHEET 5)
@ TOP OF DAM

NORMAL POOL STORAGE CAPACITY ≈ 530 AC FT (SEE NOTE 1)

DRAINAGE AREA ≈ 31.5 SQ MI. (TOTAL)
29.9 SQ. MI. (LOCAL)

[PLANIMETERED OFF USGS 7.5 MINUTE SERIES QUADS: [illegible] MAMMOTH, MOUNT PLEASANT, AND CONNELSVILLE, PA

NOTE 1: STORAGE CAPACITY VALUE OBTAINED FROM "REPORT UPON THE UPPER BRIDGEPORT DAM OF THE MOUNT PLEASANT WATER COMPANY" AS FOUND IN PENN DER FILES. THE ACTUAL GIVEN VALUE WAS 172 MILLION GALLONS OF STORAGE

DAM CLASSIFICATION

DAM SIZE - INTERMEDIATE (REF 1, TABLE 1)
(DUE TO STORAGE POTENTIAL)

HAZARD CLASSIFICATION - HIGH (FIELD OBSERVATION)

REQUIRED SDF - PMF (REF 1, TABLE 3)

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

BY WJV DATE 4-25-79 PROJ. NO. 79-617-465

CHKD. BY DLB DATE 6-4-79 SHEET NO. 2 OF 26

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HYDROGRAPH PARAMETERS

LENGTH OF LONGEST WATERCOURSE (L) ≈ 10.9 MI

L_{CA} ≈ 4.9 MI [MEASURED ALONG THE LONGEST WATERCOURSE TO THE CENTROID OF THE DRAINAGE AREA]

NOTE 2: VALUES OF L AND LCA ARE MEASURED FROM USGS 7.5 MINUTE QUADS - DONEGAL, MAMMOTH, MOUNT PLEASANT, AND CONNELSVILLE, PA. ALL VARIABLES ARE DEFINED IN REFERENCE 2 IN THE SECTION ENTITLED "SNYDER SYNTHETIC UNIT HYDROGRAPH".

C_t ≈ 1.0
C_p ≈ 0.40
} [SUPPLIED BY COE; ZONE 25 OHIO RIVER BASIN]

t_p = SNYDER'S STANDARD LAG ≈ $1.0 (L \times L_{CA})^{0.3}$

$\therefore\ t_p \approx 1.0 (10.9 \times 4.9)^{0.3} \approx 3.30$ HRS.

RESERVOIR STORAGE VOLUMES

NORMAL POOL STORAGE CAPACITY @ EL. 1053.5 ≈ 530 AC FT

NOTE 3: NORMAL POOL ELEVATION OF 1053.5 OBTAINED FROM THE U.S. SOIL CONSERVATION SERVICE, WASHINGTON, PA OFFICE WHICH HAS RECENTLY CONDUCTED A SURVEY OF THE AREA. ALTHOUGH FIGURES 3 TO 6 IN APPENDIX F HAVE THE NORMAL POOL LEVEL @ EL 1068.5 (TOP OF MASONRY SERVICE SPILLWAY), THE DATUM THAT THIS ELEVATION WAS BASED ON IS UNKNOWN. THEREFORE, NORMAL POOL LEVEL WILL BE ASSUMED TO BE @ EL 1053.5 THROUGHOUT THE CALCULATIONS

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

BY WJV DATE 4-30-79 PROJ. NO. 79-617-465

CHKD. BY DLB DATE 6-4-79 SHEET NO. 3 OF 26

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- ASSUME THE RESERVOIR IS APPROXIMATELY PARABOLIC IN CROSS-SECTION (CROSS-SECTIONS ARE TAKEN PERPENDICULAR TO SPILLWAY), SO THAT CROSS-SECTIONAL AREA (BELOW EL 1053.5) CAN BE COMPUTED BY THE RELATIONSHIP:

$$A = \tfrac{4}{3}\, D\, \tfrac{W}{2} \qquad \text{(REF. 14, PG 13)}$$

WHERE A = AREA IN FT^2, D = DEPTH OF RESERVOIR IN FT @ THE MOST DOWNSTREAM SECTION, AND W = AVERAGE TOP WIDTH OF THE RESERVOIR IN FT.

- MAXIMUM RESERVOIR DEPTH ≈ 14 FT (APPENDIX C, FIG 6) @ NORMAL POOL

AVERAGE RESERVOIR TOP WIDTH ≈ 450 FT (ESTIMATED FROM USGS MAPS) @ NORMAL POOL

MAXIMUM RESERVOIR LENGTH (RL) ≈ 5500FT (ESTIMATED FROM USGS MAP) @ NORMAL POOL

ASSUME THAT BOTH RESERVOIR LENGTH AND TOP WIDTH VARY LINEARLY WITH DEPTH. ALSO ASSUME THAT AREA VARIES FROM A @ THE MOST DOWNSTREAM SECTION TO 0.0 @ THE MOST UPSTREAM SECTION.

$$\Rightarrow \frac{\Delta RL}{\Delta D} = \frac{5500\,FT}{14\,FT} \approx 393\ FT/FT\ ; \quad \frac{\Delta W}{\Delta D} = \frac{450\,FT}{14\,FT} \approx 32\ FT/FT$$

∴ COMPUTED STORAGE VOLUME @ NORMAL POOL EL. 1053.5:

$$\text{VOLUME} = \text{AVERAGE AREA} \times \text{RESERVOIR LENGTH} \,/\, 43560\ \tfrac{FT^2}{AC}$$

$$V = \left(\frac{A + 0.0}{2}\right) \times \left(\frac{\Delta RL}{\Delta D} \times D\right) / 43560$$

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

BY WJV DATE 4-30-79 PROJ. NO. 78-617-465

CHKD. BY DLB DATE 6-4-79 SHEET NO. 4 OF 26

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$$A = {}^{4}/_{3}\, D \left(\frac{\Delta W}{\Delta D} \times D\right)/2 = {}^{4}/_{3}\,(14\,FT)\left(32\,\frac{FT}{FT} \times 14\,FT\right)/2$$
$$\approx 4200\,FT^2$$

$$V = \left(\frac{4200+0}{2}\right) \times \left(393\,\frac{FT}{FT} \times 14\,FT\right)/43560$$
$$\approx 265\,AC\text{-}FT$$

- ACTUAL ASSUMED STORAGE VOLUME ≈ 530 AC-FT (SHEET 1)
  ⇒ CORRECTION FACTOR ≈ $530\,AC\text{-}FT / 265\,AC\text{-}FT \approx 2.0$

- ELEVATION-STORAGE RELATIONSHIP BELOW NORMAL POOL EL 10532.5:

ELEVATION (FT)	MAXIMUM RESERVOIR DEPTH D (FT)	AVERAGE RESERVOIR WIDTH W (FT)	MAXIMUM RESERVOIR X-SECT. AREA A (FT^2)	MAXIMUM RESERVOIR LENGTH RL (FT)	COMPUTED STORAGE VOLUME V (AC-FT)	CORRECTED STORAGE VOLUME V (AC-FT) } V×2.0
1039.5	0	-	-	-	0	0
1041.5	2	64	95	78%	0.8	1.6
1043.5	4	128	341	1572	6.2	12.4
1045.5	6	192	768	2358	20.8	41.6
1047.5	8	256	1365	3144	49.3	98.6
1049.5	10	320	2133	3930	96.2	192
1051.5	12	384	3072	4716	166	332
1053.5	14	450	4200	5500	265	530

- ABOVE EL 10535 ⇒ ASSUME THE MODIFIED PRISMOIDAL RELATIONSHIP CAN ADEQUATELY REPRESENT THE TRUE STORAGE VALUES:

$$\Delta V_{1\to 2} = {}^{h}/_{3}\left(A_1 + A_2 + \sqrt{A_1 \times A_2}\right) \qquad \text{(REF 14, P.15)}$$

WHERE $\Delta V_{1\to 2}$ = INCREMENTAL VOLUME BETWEEN ELEVATIONS 1 AND 2,
A_1 = SURFACE AREA @ ELEVATION 1,
A_2 = SURFACE AREA @ ELEVATION 2, AND
h = ELEVATION 2 - ELEVATION 1

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

BY WJV DATE 4-30-79 PROJ. NO. 78-617-465

CHKD. BY DLB DATE 6-4-79 SHEET NO. 5 OF 26

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- SURFACE AREA (SA) @ EL 1053.5 ≈ 91AC (SEE REF IN NOTE 1, SHEET 1)

SURFACE AREA @ EL 1060 ≈ 200AC ⇒ [PLANIMETERED OFF USGS QUADS: CONNELLSVILLE AND MOUNT PLEASANT, PA]

∴ RATE OF RESERVOIR SA CHANGE PER FOOT OF RESERVOIR RISE:

$$\Delta SA/\Delta h \approx (200AC - 91AC)/(1060FT - 1053.5FT) \approx 19.3\ AC/FT$$

$$\Rightarrow A_i \approx 91\ AC + (19.3\ ^{AC}/_{FT} \times h)$$

WHERE h = ELEVATION 2 - 1053.5 FT

- ELEVATION - STORAGE RELATIONSHIP ABOVE EL 1053.5:

	ELEVATION (FT)	h (FT)	A_i (ACRES)	ΔV_{1-2} (AC-FT)	CUMULATIVE VOLUME (AC-FT)
SERVICE SPILLWAY CREST	- 1053.5	0	91	-	530 *
	1054.0	0.5	90	43	570
	1055.0	1.5	103	99	670
	1056.0	2.5	127	117	790
	1057.0	3.5	145	136	930
	1058.0	4.5	163	154	1090
LOW TOP OF DAM	- 1059.0	5.5	182	172	1250
	1060.0	6.5	200	191	1440
	1061.0	7.5	218	209	1650
	1062.0	8.5	237	227	1880
	1063.0	9.5	255	246	2130
	1064.0	10.5	273	264	2390
	1065.0	11.5	291	282	2670

* SEE SHEET 4

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

BY WJV DATE 5-1-79 PROJ. NO. 79-617-465

CHKD. BY DLB DATE 6-4-79 SHEET NO. 6 OF 26

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PMP CALCULATIONS

- APPROXIMATE RAINFALL INDEX = 24 IN (REF 3, FIG 1)
  (CORRESPONDING TO A DURATION OF 24 HOURS AND AN AREA OF 200 SQ MI IN SOUTHWESTERN PENNSYLVANIA)

- DEPTH - AREA - DURATION ZONE #7 (REF 3, FIG 1)

- LOCAL DRAINAGE AREA ≈ 29.9 SQ MI. HOWEVER, THE STORM WILL BE CENTERED OVER THE TOTAL DRAINAGE AREA OF 31.5 SQ MI.
  ⇒ DEPTH-DURATION RELATIONSHIP BASED ON DA = 31.5 SQ. MI. :

DURATION (HR)	PERCENT OF INDEX RAINFALL (%)
6	90
12	108
24	118
48	128

(REF 3, FIG 2)

- HOP BROOK FACTOR (ADJUSTMENT FOR BASIN SHAPE AS WELL AS FOR THE LESSER LIKELIHOOD OF A SEVERE STORM CENTERING OVER A SMALLER BASIN) CORRESPONDING TO A DA ≈ 31.5 SQ MI.
  ⇒ 0.937 (AS COMPUTED BY HEC-1)

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

BY WJV DATE 5-1-79 PROJ. NO. 79-617-465

CHKD. BY DLB DATE 6-4-79 SHEET NO. 7 OF 26

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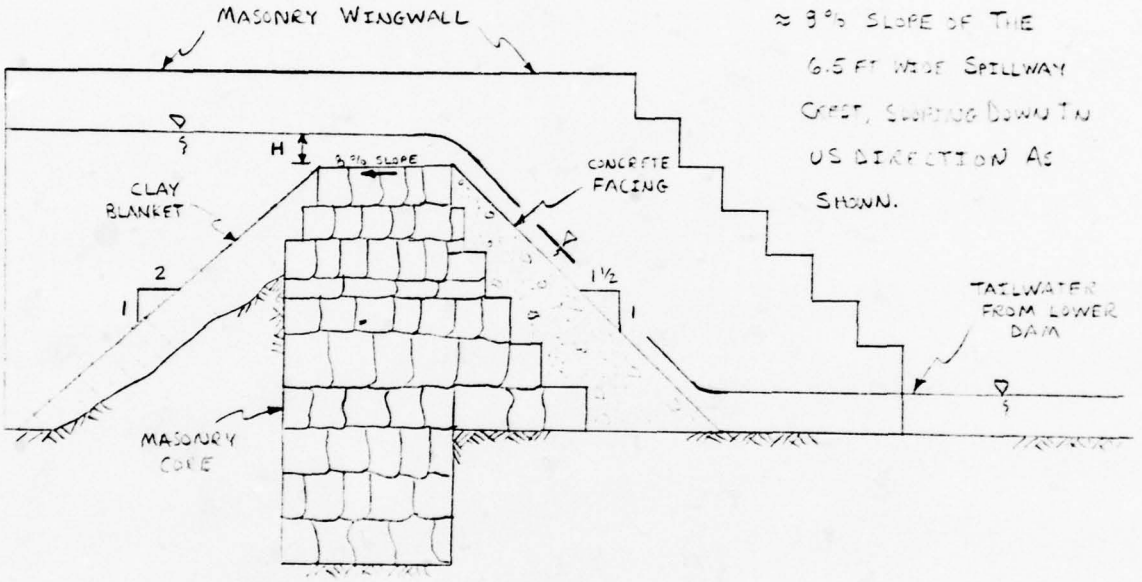
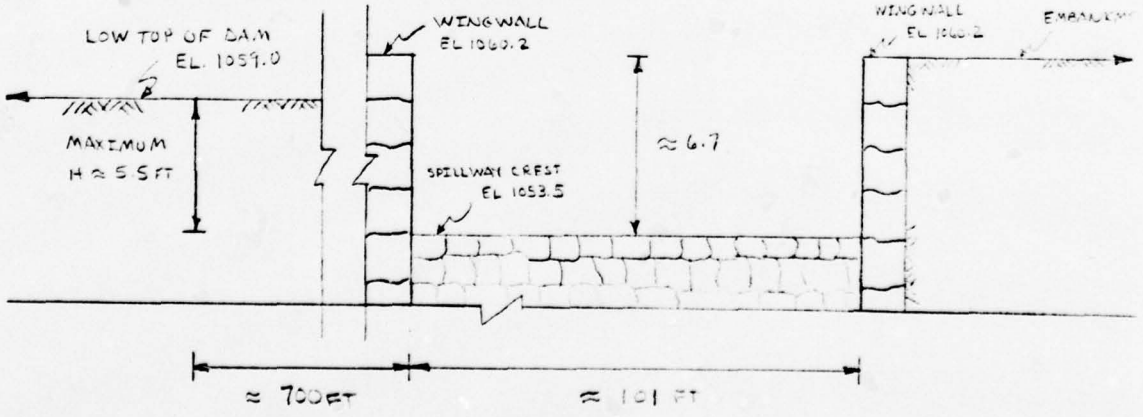
SPILLWAY CAPACITY (SERVICE)

- PROFILE OF SERVICE SPILLWAY : (NOT TO SCALE)
(FROM FIG 3 AS WELL AS FIELD MEASUREMENT AND OBSERVATION)



- CROSS-SECTION OF SERVICE SPILLWAY : (NOT TO SCALE)
(FROM FIG 4 AS WELL AS FIELD MEASUREMENT AND OBSERVATION)



SECTION IS TAKEN LOOKING UPSTREAM TOWARDS DAM

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- THE DISCHARGE OVER THE TRAPEZOIDAL-SHAPED SPILLWAY WEIR CAN BE DEFINED BY THE EQUATION:

$$Q = CLH^{3/2} \qquad \text{(REF 5, PG 5-3)}$$

WHERE C = DISCHARGE COEFFICIENT = f (WEIR SHAPE),
L = LENGTH OF WEIR ≈ 101 FT, AND
H = HEAD OVER THE WEIR OR THE HEIGHT OF THE RESERVOIR LEVEL ABOVE THE CREST OF THE WEIR IN FT (SEE SKETCH ON SHEET 7). (ASSUME APPROACH VELOCITY IS NEGLIGIBLE)

- THE APPROXIMATE DISCHARGE COEFFICIENT (C) FOR THE WEIR SHAPE GIVEN IN THE SKETCH ON SHEET 7 IS ASSUMED TO BE 3.6 (REF 5, PG 5-49, TABLES 5-9 AND 5-10) FOR THE MAXIMUM HEAD OF 5.5 FT.

$$\therefore \quad Q = CLH^{3/2} = (3.6)(101\text{ft})(5.5\text{ft})^{3/2}$$

$$Q \approx 4690 \text{ CFS} = \text{SERVICE SPILLWAY CAPACITY}$$

SPILLWAY RATING CURVE (SERVICE)

AS THE HEAD OVER THE WEIR BECOMES SMALL, THE ROUGHNESS OF THE CREST AND THE CONTACT PRESSURE BETWEEN THE WATER AND THE CREST EXERT A LARGER INFLUENCE ON DISCHARGE. THAT IS, THE C-VALUES DECREASE WITH DECREASING HEAD. THE OPPOSITE TREND OCCURS FOR HIGHER HEADS. THEREFORE, ASSUME THAT THE DISCHARGE COEFFICIENT - HEAD RELATIONSHIP FOR AN OGEE-CRESTED WEIR (REF 4, PG 376, FIG 251) CAN REPRESENT THE ACTUAL DISCHARGE COEFFICIENT - HEAD RELATIONSHIP

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

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FOR THIS TRAPEZOIDAL WEIR. THE MAXIMUM HEAD PRIOR TO OVERTOPPING OF THE DAM, 5.5 FT, WILL BE ASSUMED TO BE THE DESIGN HEAD (H_o). THE DESIGN DISCHARGE COEFFICIENT (C_o) OF 3.6 IS GIVEN ON SHEET 8. ALL DISCHARGES ARE DEFINED BY $Q = CLH^{3/2}$ AS ON SHEET 8, W/ THE C-VALUE ADJUSTED FOR SUBMERGENCE ACCORDING TO TAILWATER LEVEL AND THE SUBMERGENCE RELATIONSHIP FOR AN OGEE-CRESTED SPILLWAY (REF 4, PG 382)

RESERVOIR ELEVATION (FT)	H (FT)	H/H_o (FT/FT)	(A) C/C_o	(B) C	(C) INITIAL "UNSUBMERGED" Q (CFS)	(D) TAILWATER ELEVATION (FT)	(E) h_d (FT)	h_d/H (FT/FT)	(F) C_s/C	(G) C_s	(H) FINAL Q (CFS)
1053.5	0	–	–	–	0	–	–	–	–	–	0
1054.5	1	0.2	0.85	3.1	310	1043.8	10.7	10.7	1.0	3.1	310
1055.5	2	0.4	0.90	3.2	910	1045.0	10.5	5.3	1.0	3.2	910
1056.5	3	0.55	0.93	3.3	1730	1046.6	9.9	3.3	1.0	3.3	1730
1057.5	4	0.7	0.96	3.5	2830	1048.9	8.6	2.2	1.0	3.5	2830
1058.5	5	0.9	0.99	3.6	4070	1051.6	6.9	1.4	1.0	3.6	4070
1059.0	5.5	1.0	1.0	3.6	4690	1052.6	6.4	1.2	1.0	3.6	4690
1059.5	6	1.1	1.01	3.6	5340	1053.5	6.0	1.0	1.0	3.6	5340
1060.5	7	1.3	1.04	3.7	6920	1055.3	5.2	0.74	1.0	3.7	6920
1061.5	8	1.5	1.06	3.8	8630	1057.2	4.3	0.54	0.98	3.7	8460
1062.0	8.5	1.55	1.07	3.9	9760	1058.3	3.7	0.44	0.96	3.7	9360
1063.0	9.5	1.7	1.07	3.9	11530	1060.3	2.7	0.28	0.92	3.6	10650
1064.0	10.5	1.9	1.09	3.9	13400	1062.2	1.8	0.17	0.81	3.2	11000
1065.0	11.5	2.1	1.09	3.9	15360	1064.2	0.8	0.07	0.54	2.1	8270

(A) FROM REF 4, FIG 246 (PG 378), BASED ON H/H_o VALUE

(B) $C = 3.6 \times C/C_o$ (C) $Q = CLH^{3/2}$

(D) TW ELEVATION BASED ON TOTAL "UNSUBMERGED" FLOWS OVER THE SERVICE + EMERGENCY SPILLWAYS + EMBANKMENT (SHEETS 12, 14 AND 17)

(E) h_d = ELEVATION OF RESERVOIR – TAILWATER ELEVATION

(F) FROM REF 4, FIG 254 (PG 382), BASED ON h_d/H VALUE

(G) $C_s = C \times C_s/C$

(H) $Q = C_s L H^{3/2}$

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UPPER BRIDGEPORT DAM

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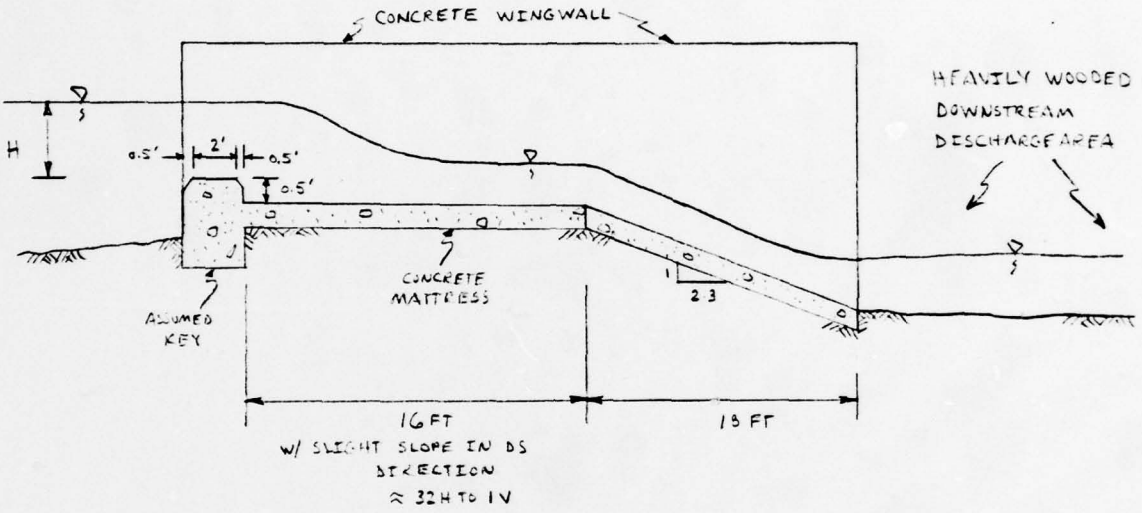
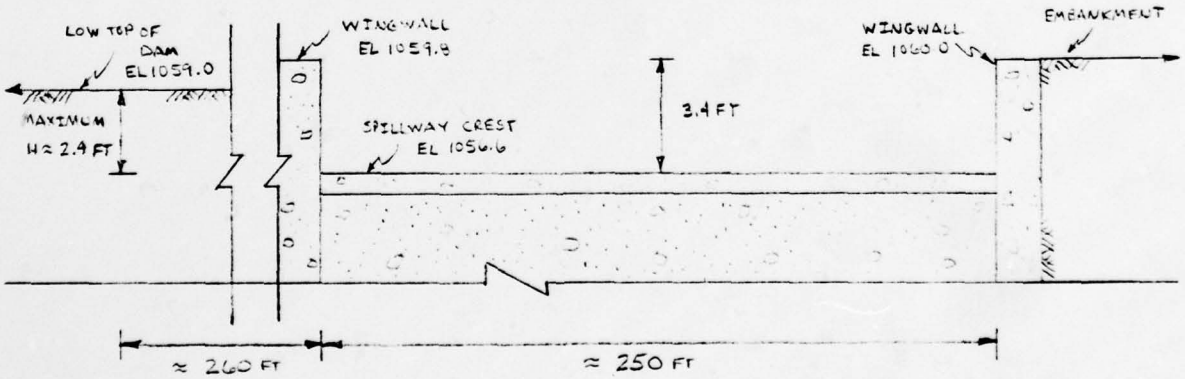
SPILLWAY CAPACITY (EMERGENCY)

- PROFILE OF EMERGENCY SPILLWAY : (NOT TO SCALE)
(FROM FIG 5 AS WELL AS FIELD MEASUREMENT AND OBSERVATION)



- CROSS-SECTION OF EMERGENCY SPILLWAY : (NOT TO SCALE)
(FROM FIG 5 AS WELL AS FIELD MEASUREMENT AND OBSERVATION)



SECTION IS TAKEN LOOKING UPSTREAM
TOWARDS DAM

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

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- THE DISCHARGE OVER THE "BROAD-CRESTED" EMERGENCY SPILLWAY WEIR IS ALSO DEFINED BY THE EQUATION:

$$Q = CLH^{3/2} \qquad \text{(SHEET 8)}$$

HOWEVER, IN THIS CASE $L \approx 250$ FT

- SINCE THE WEIR IS ESSENTIALLY BROAD-CRESTED W/ A CREST WIDTH OF $\approx$ 16FT, AND A MAXIMUM HEAD OF 2.4 FT $\Rightarrow$ "C" $\approx$ 2.63 (REF 6, PG 21-71).

$$\therefore Q = CLH^{3/2} \approx (2.63)(250\text{ FT})(2.4\text{ FT})^{3/2} \approx 2440 \text{ CFS}$$

- TOTAL DAM DISCHARGE PRIOR TO OVERTOPPING:

$$Q_{TOTAL} = 2440 \text{ CFS} + 4690 \text{ CFS} \approx 7130 \text{ CFS}$$
$$\hookrightarrow \text{(SHEET 9)}$$

$\Rightarrow$ TAILWATER ELEVATION CORRESPONDING TO 7130 CFS $\approx$ EL 1052.6 (SHEET 19).

SINCE THE BROAD-CREST OF THE EMERGENCY SPILLWAY IS @ $\approx$ EL 1056.1 FT $\Rightarrow$ NO SUBMERGENCE EFFECTS

$\therefore$ EMERGENCY SPILLWAY CAPACITY $\approx$ 2440 CFS

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

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SPILLWAY RATING CURVE (EMERGENCY)

AS INDICATED IN REF 6 (TABLE 21-15, PG 21-71), THE DISCHARGE COEFFICIENT FOR A 16FT WIDE BROAD-CRESTED WEIR DOES NOT VARY TOO MUCH FROM THE VALUE OF 2.62 ⇒ ALL DISCHARGES ARE DEFINED BY $Q = CLH^{3/2}$ AS ON SHEET 11 W/ $C \approx 2.63$.

THE EFFECT OF SUBMERGENCE ON DECREASING DISCHARGE CAPACITY WILL BE CONSIDERED AS IT WAS FOR THE SERVICE SPILLWAY (SHEET 11). THE ELEVATION OF THE BROAD CREST OF THE SPILLWAY IS ≈ 1056.1 FT

ELEVATION (FT)	H (FT)	INITIAL Q "UNSUBMERGED" (CFS)	(A) TAILWATER ELEVATION (FT)	(B) h_d (FT)	h_d/H	(C) C_s/C	(D) C_s	(E) FINAL Q
* 1056.6	0	0	1046.7	—	—	—	—	0
1057.5	0.9	560	1048.9	8.6	9.6	1.0	2.62	560
1058.5	1.9	1720	1051.6	6.9	3.6	1.0	2.62	1720
LOW TOP OF DAM → 1059.0	2.4	2440	1052.6	6.4	2.7	1.0	2.63	2440
1059.5	2.9	3250	1053.5	6.0	2.1	1.0	2.63	3250
1060.5	3.9	5060	1055.3	5.2	1.3	1.0	2.63	5060
1061.5	4.9	7130	1057.2	4.3	0.88	1.0	2.63	7130
1062.0	5.4	8250	1058.3	3.7	0.69	1.0	2.63	8250
1063.0	6.4	10650	1060.3	2.7	0.42	0.96	2.52	10200
1064.0	7.4	13240	1062.2	1.8	0.24	0.90	2.37	11930
1065.0	8.4	16010	1064.2	0.8	0.10	0.65	1.71	10410

(A) TW ELEV BASED ON TOTAL UNSUBMERGED FLOW (SEE (D) ON SHEET 9)

(B) h_d = ELEVATION OF RESERVOIR − ELEVATION OF TAILWATER

(C) C_s/C OBTAINED FROM REF 4, PG 382, BASED ON h_d/H VALUE

(D) $C_s = 2.62 \times (C_s/C)$

(E) $Q = C_s (25\text{FT}) (H)^{3/2}$

* ELEVATION OF 1056.6 CORRESPONDS TO THE ELEVATION OF THE TOP OF THE SMALL 0.5' CONCRETE WEIR SECTION AT THE U/S END OF THE EMERGENCY SPILLWAY (SEE SKETCH ON SHEET 10).

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EMBANKMENT RATING CURVE

- LENGTH OF EMBANKMENT SUBMERGED VS RESERVOIR ELEVATION (BASED ON FIELD MEASUREMENTS)

EMBANKMENT LENGTH (FT)	RESERVOIR ELEVATION (FT)
50	1059.0
250	1059.5
320	1060.0
620	1060.5
670	1061.0
670	1061.5
670	1062.0
670	1063.0

- ASSUME THE EMBANKMENT ACTS LIKE A BROAD-CRESTED WEIR WHEN OVERTOPPED W/ DISCHARGE DEFINED BY:

$$Q = CLH^{3/2} \qquad \text{(SHEET 11)}$$

HOWEVER IN THIS CASE (ASSUMING A TRAPEZOIDAL SHAPED WEIR W/ BOTTOM WIDTH ≈ 50 FT), H = WEIGHTED VALUE = [(H, ABOVE LEVEL, 50 FT, SECTION × CORRESPONDING FLOW AREA) + (AVERAGE H_2 ABOVE INCLINED SECTION WHICH VARIES FROM 0 TO H_1 × CORRESPONDING FLOW AREA)] / (TOTAL FLOW AREA)
C = DISCHARGE COEFFICIENT = f (H/ℓ, w/ℓ = CREST WIDTH ≈ 25FT; AND REF 12, PG 46)
POSSIBLE SUBMERGENCE UNDER HIGH FLOWS WILL BE CONSIDERED W/ ADJUSTMENTS MADE TO C VIA THE SUBMERGENCE CURVE OF REF 12, PG 46.

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UPPER RIDGEPOINT DAM

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RESERVOIR ELEVATION (FT)	LEVEL CREST PORTION H_1 (FT)	① A_1 (FT^2)	$H_1 \times A_1$ (FT^3)	INCLINED CREST PORTIONS ② H_2 (FT)	③ A_2 (FT^2)	$H_2 \times A_2$ (FT^3)	④ WEIGHTED H (FT)	H/ℓ (FT/FT)	⑤ C	L (FT)	⑥ INITIAL UNSUBMERGED Q	⑦ TAILWATER ELEVATION (FT)	⑧ C_s/C	⑨ C_s	⑩ Q (CFS)
1059.0	0	-	-	0	-	-	0	-	-	50	0	1052.9	-	-	0
1059.5	0.5	25	12.5	0.25	50	12.5	0.33	0.01	2.99	250	140	1053.5	1.0	2.99	140
1060.0	1.0	50	50	0.50	135	67.5	0.64	0.03	3.02	320	490	1054.4	1.0	3.02	490
1060.5	1.5	75	112.5	0.75	428	321	0.86	0.03	3.03	620	1500	1055.3	1.0	3.03	1500
1061.0	2.0	100	200	1.00	620	620	1.14	0.05	3.04	670	2480	1056.3	1.0	3.04	2480
1061.5	2.5	125	312.5	1.50	930	1395	1.62	0.06	3.04	670	4200	1057.2	1.0	3.04	4200
1062.0	3.0	150	450	2.00	1240	2480	2.11	0.08	3.05	670	6260	1058.3	1.0	3.05	6260
1063.0	4.0	200	800	3.00	1860	5580	3.10	0.12	3.05	670	11150	1060.3	1.0	3.05	11150
1064.0	5.0	250	1250	4.00	2480	9920	4.10	0.16	3.06	670	17020	1062.2	0.64	3.06	17020
1065.0	6.0	300	1800	5.00	3100	15500	5.10	0.20	3.07	670	23690	1064.2	0.87	2.98	23000

① $A_1 = H_1 \times 50FT$ w/ H_1 = RESERVOIR ELEVATION - 1059.0 FT ; ② $H_2 = \left(\frac{0+H_1}{2}\right)$ BELOW EL 1061, AND $H_2 = \left[\frac{H_1 + (\text{RESERVOIR ELEVATION} - 1061.0)}{2}\right]$ ABOVE EL 1061 ; ③ $A_2 = [(L-50FT) \times H_1]/2$ BELOW EL 1061, AND $A_2 = \left([(L-50FT) \times 2ft/2) + [(\text{ELEVATION OF RESERVOIR} - 1061) \times (L-50)\right]$ w/ L = 670 FT ABOVE EL 1061 ; ④ $H = [(H_1 \times A_1) + (H_2 \times A_2)]/(A_1 + A_2)$; ⑤ REF 12, PG 96 ; ⑥ $Q = CLH^{3/2}$;

⑦ TAILWATER ELEVATION IS BASED ON TOTAL "UNSUBMERGED" FLOWS OVER THE SERVICE & EMERGENCY SPILLWAYS & EMBANKMENT (SHEETS 7, 12 AND 19); ⑧ C_s/C FROM REF 12, PG 96, BASED ON h_d/H_1 (SEE SHEET 12);

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TOTAL FACILITY RATING CURVE

TOTAL DISCHARGE = SERVICE SPILLWAY Q + EMERGENCY SPILLWAY Q + EMBANKMENT Q

ELEVATION (FT)	SERVICE SPWY Q (CFS)	EMERGENCY SPWY Q (CFS)	EMBANKMENT Q (CFS)	TOTAL Q (CFS)
1053.5	0	–	–	0
1054.5	310	–	–	310
1055.5	910	–	–	910
1056.5	1730	–	–	1730
1057.5	2830	560	–	3390
1058.5	4070	1720	–	5790
1059.0	4690	2440	0	7130
1059.5	5340	3250	140	8730
1060.0	6130	4160	490	10780
1060.5	6920	5060	1500	13480
1061.0	7690	6100	2490	16270
1061.5	8460	7130	4200	19790
1062.0	9260	8250	6260	23770
1063.0	10650	10200	11150	32000
1064.0	11000	11930	17020	39950
1065.0	9270	10410	23000	41680

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LOWER BRIDGEPORT DAM

THE CREST OF LOWER BRIDGEPORT DAM IS LOCATED ABOUT 2400 FT DS FROM THE UPPER BRIDGEPORT DAM. THE RESERVOIR OF THE LOWER DAM EXTENDS FOR THE ENTIRE 2400 FT AND IS APPROXIMATELY 100 TO 150 FT WIDE THRUGHOUT. THE DAM IS A "RUN OF THE RIVER" OVERFLOW STRUCTURE. THE DAM IS ESSENTIALLY ABOUT A 90-FT CONCRETE WEIR WITH A 6.5-FT FORBAY DEPTH, AND A 3.5 FT DESIGN HEAD. THE VALLEY SECTION WHICH INCLUDES THE DAM IS SKETCHED ON SHEET 21, SECTION 4.0.

IN ORDER TO CONSIDER THE EFFECTS OF THE LOWER IMPOUNDMENT ON THE UPPER BRIDGEPORT DAM OUTFLOWS, BACKWATER CURVES WILL BE DEVELOPED FOR VARIOUS ASSUMED FLOWS. THE BACKWATER CURVES WILL BE COMPUTED VIA THE HEC-2 WATER SURFACE PROFILE COMPUTER PROGRAM*. HEC-2 CALCULATES BACKWATER CURVES BY THE STANDARD STEP METHOD (REF 7, PG 274-280) BASED ON VALLEY AND CHANNEL CROSS-SECTION INFORMATION. THE SPECIFIC CROSS-SECTION INFORMATION TO BE USED IS GIVEN ON SHEETS 20 AND 21. (THE SHAPE OF THE RESERVOIR PORTIONS OF THE SECTIONS WERE ASSUMED FOR THE MOST PART.)

A RATING CURVE FOR THE DAM SECTION (SECTION 4) WILL BE COMPUTED AND USED AS THE STARTING POINT OF THE CALCULATIONS. THE PROFILES WILL THEN PROCEED UPSTREAM 50 FT TO SECTION 3.0, THEN 1100 FT MORE UPSTREAM TO SECTION 2.0, THEN 700 FT FURTHER UPSTREAM TO SECTION 1.0 (THE LOCATION OF THE 1ST STRUCTURE DOWNSTREAM FROM THE UPPER DAM). FINALLY, THE PROFILES WILL PROCEED THE REMAINING 550 FT UPSTREAM TO SECTION 0.0 @ THE UPPER DAM.

* HEC-2 WATER SURFACE PROFILES (USER'S MANUAL), HYDROLOGIC ENGINEERING CENTER, U.S. ARMY CORPS OF ENGINEERS, DAVIS, CALIFORNIA, NOV. 1976

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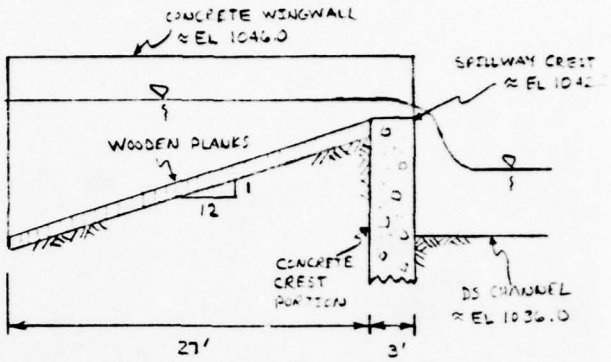
- SECTION 4.0 RATING CURVE:

LOWER DAM PROFILE ⇒
(FROM FIELD MEASUREMENT AND OBSERVATION)



a) DISCHARGE OVER THE DAM IS GOVERNED BY THE RELATIONSHIP:

$$Q = CLH^{3/2}$$ (REF 5, PG 5-23)

WHERE Q = DISCHARGE IN CFS,
L = LENGTH OF SPILLWAY ≈ 90 FT,
H = DEPTH OF WATER ABOVE SPILLWAY CREST, AND
C ≈ 3.1 (REF 5, PG 5-11; ESTIMATED FROM TABLE 5-11).

b) ASSUME THAT BY THE TIME H ≈ 7.5 FT (WSEL ≈ 1050.0 @ SECT 4.0) THE TAILWATER ON THE DAM WILL BE HIGH ENOUGH TO DROWN OUT THE WEIR, SO THAT OPEN CHANNEL FLOW WILL CONTROL THE DISCHARGE CAPABILITIES OF THE SECTION

c) OPEN CHANNEL DISCHARGES FOR THE OVERHANG SECTIONS BELOW EL 1050.0, AND FOR THE ENTIRE SECTION ABOVE EL 1050.0 WILL BE GOVERNED BY MANNING'S EQUATION:

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$ (REF 7, PG 129)

WHERE Q = DISCHARGE IN CFS;
n = ROUGHNESS COEFFICIENT (SHEET 21, SECTION 4),
A = CROSS-SECTIONAL AREA IN FT^2,
$R = \frac{\text{CROSS-SECTIONAL AREA}}{\text{WETTED PERIMETER}}$ IN FT, AND
S ≈ CHANNEL SLOPE ≈ 0.001 (ASSUMED)

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d) RATING INFORMATION BELOW EL 1050 FT :

	WATER SURFACE ELEVATION (FT)	WEIR FLOW H (FT)	WEIR FLOW Q (CFS)	OVERBANK FLOW MAXIMUM FLOW DEPTH (FT)	OVERBANK FLOW A* (FT²)	OVERBANK FLOW R* (FT)	OVERBANK FLOW Q (CFS)	TOTAL SECTION FLOW (CFS)
CREST OF LOWER DAM —	1042.5	0	0	0	—	—	0	0
	1043.5	1	290	0	—	—	0	290
	1044.5	2	790	0	—	—	0	790
	1045.5	3	1450	0	—	—	0	1450
	1046.5	4	2230	0.5	6.6	0.4	0	2230
	1047.5	5	3120	1.5	29.1	1.0	20	3140
	1048.5	6	4100	2.5	64.1	1.5	70	4170
	1049.5	7	5170	3.5	111.6	1.9	130	5300
	1050.0	7.5	5730	4	140.0	2.2	190	5920

* FROM SECTION 4.0 GEOMETRY (SHEET 21)

e) RATING INFORMATION ABOVE EL 1050 FT :

MAIN CHANNEL (ABOVE DAM CREST) ⇒

TOTAL AREA BELOW EL 1050 FT ≈ 675 FT²

TOTAL WETTED PERIMETER BELOW EL 1050 FT ≈ 97 FT

$n \approx 0.02$

$S \approx 0.001$ FT/FT

OVERBANK AREA ⇒

TOTAL AREA BELOW EL 1050 FT ≈ 140 FT²

TOTAL WETTED PERIMETER BELOW EL 1050 FT ≈ 64 FT

$n \approx 0.125$

$S \approx 0.001$ FT/FT

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WATER SURFACE ELEVATION (FT)	MAXIMUM DEPTH ABOVE EL 1050 (FT)	MAIN CHANNEL A (FT^2)	MAIN CHANNEL R (FT)	MAIN CHANNEL Q (CFS)	OVERBANK AREA A (FT^2)	OVERBANK AREA R (FT)	OVERBANK AREA Q (CFS)	TOTAL SECTION FLOW (CFS)
1050	0	—	—	—	—	—	—	5920
1051	1	765	7.9	7150	940	0.6	230	7380
1052	2	955	9.8	8590	2320	1.5	1150	9740
1053	3	945	9.7	10130	3940	2.5	2660	12790
1054	4	1035	10.7	11840	5370	3.4	4580	16420
1055	5	1125	11.6	13580	6940	4.4	7030	20610
1056	6	1215	12.5	15420	8540	5.3	9780	25200
1057	7	1305	13.5	17430	10160	6.2	12920	30350
1058	8	1395	14.4	19450	11810	7.0	16290	35740
1059	9	1485	15.3	21560	13490	7.9	20160	41720
1060	10	1575	16.2	23760	15190	8.8	24410	48170
1061	11	1665	17.2	26140	16930	9.7	29030	55170
1062	12	1755	18.1	29500	19700	10.6	34010	62910

- HEC-2 ELEVATION-DISCHARGE RELATIONSHIP @ SECTION 0.0
(@ UPPER BRIDGEPORT DAM)

ELEVATION (FT)	FLOW (CFS)
1043.7	290
1046.2	1450
1048.6	3140
1051.1	5300
1051.7	5920
1052.8	7380
1054.0	9740
1055.1	12790
1056.3	16420
1057.4	20610
1058.5	25200
1059.7	30350
1060.8	35740
1063.0	49170

ELEVATION (FT)	FLOW (CFS)
1064.2	55170
1065.3	62510

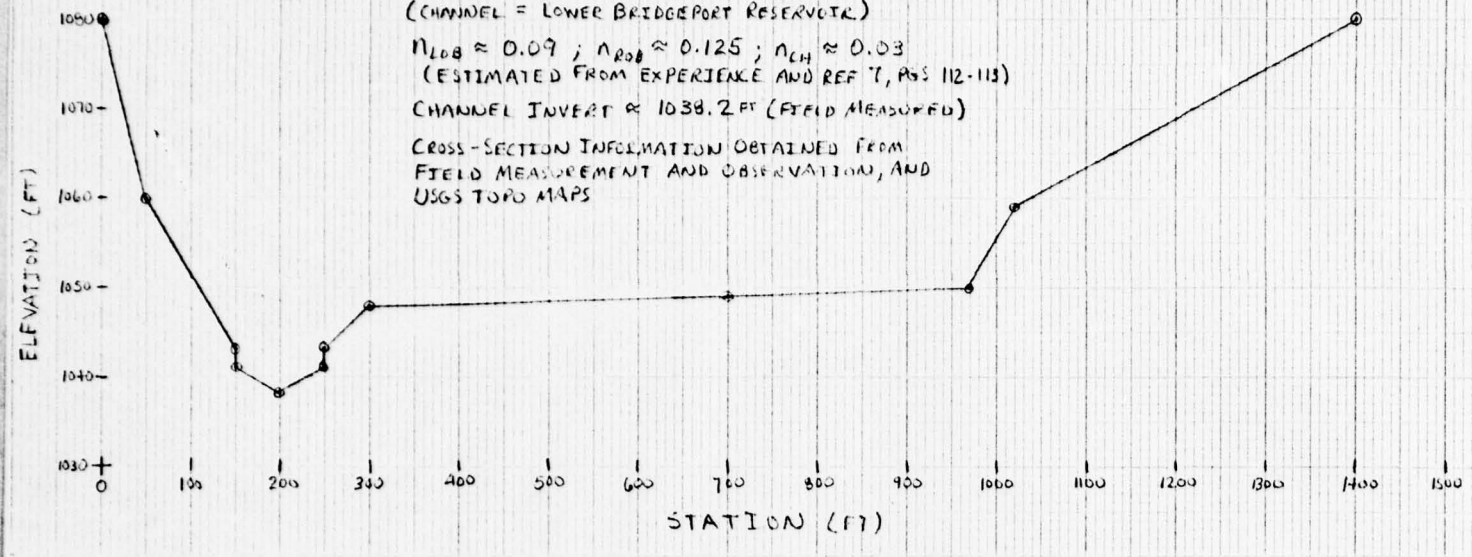
SECTION 0.0 ⇒ JUST DS FROM EMBANKMENT

AVERAGE CHANNEL SLOPE ≈ 0.001 (ASSUMED)
(CHANNEL = LOWER BRIDGEPORT RESERVOIR)

$n_{LOB} \approx 0.09$; $n_{ROB} \approx 0.125$; $n_{CH} \approx 0.03$
(ESTIMATED FROM EXPERIENCE AND REF 7, PGS 112-113)

CHANNEL INVERT ≈ 1038.2 FT (FIELD MEASURED)

CROSS-SECTION INFORMATION OBTAINED FROM FIELD MEASUREMENT AND OBSERVATION, AND USGS TOPO MAPS



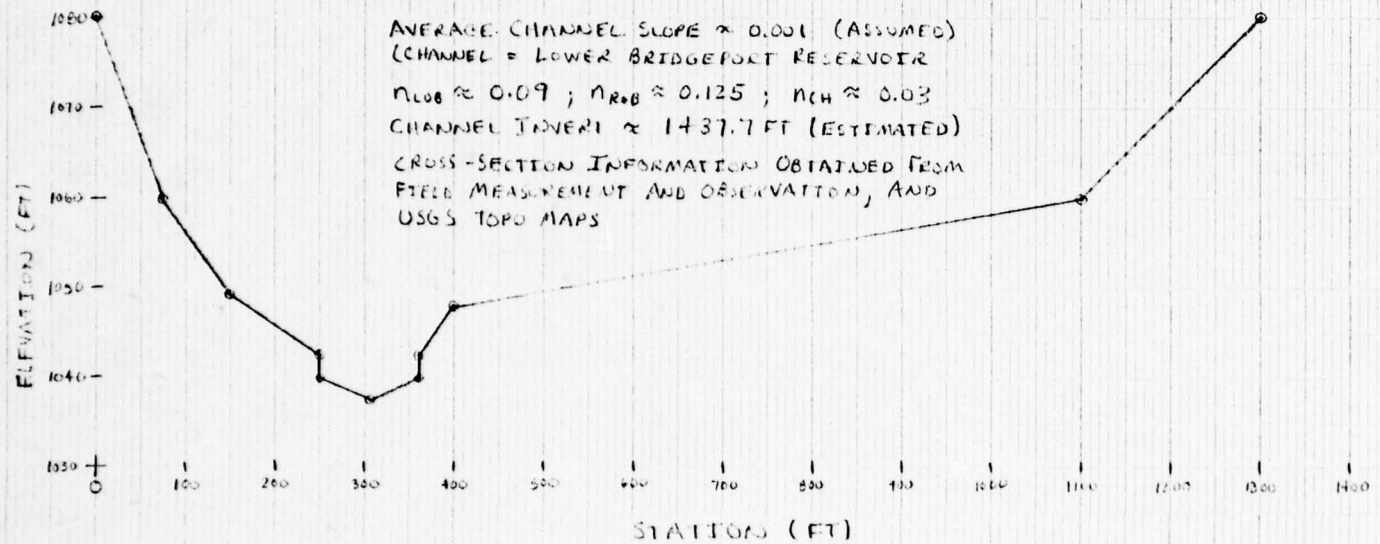
SECTION 1.0 ⇒ ≈ 550' DS FROM UPPER DAM (@ 1ST STRUCTURE)
AND ≈ 1950' DS FROM LOWER DAM

AVERAGE CHANNEL SLOPE ≈ 0.001 (ASSUMED)
(CHANNEL = LOWER BRIDGEPORT RESERVOIR

$n_{LOB} \approx 0.09$; $n_{ROB} \approx 0.125$; $n_{CH} \approx 0.03$

CHANNEL INVERT ≈ 1037.7 FT (ESTIMATED)

CROSS-SECTION INFORMATION OBTAINED FROM FIELD MEASUREMENT AND OBSERVATION, AND USGS TOPO MAPS



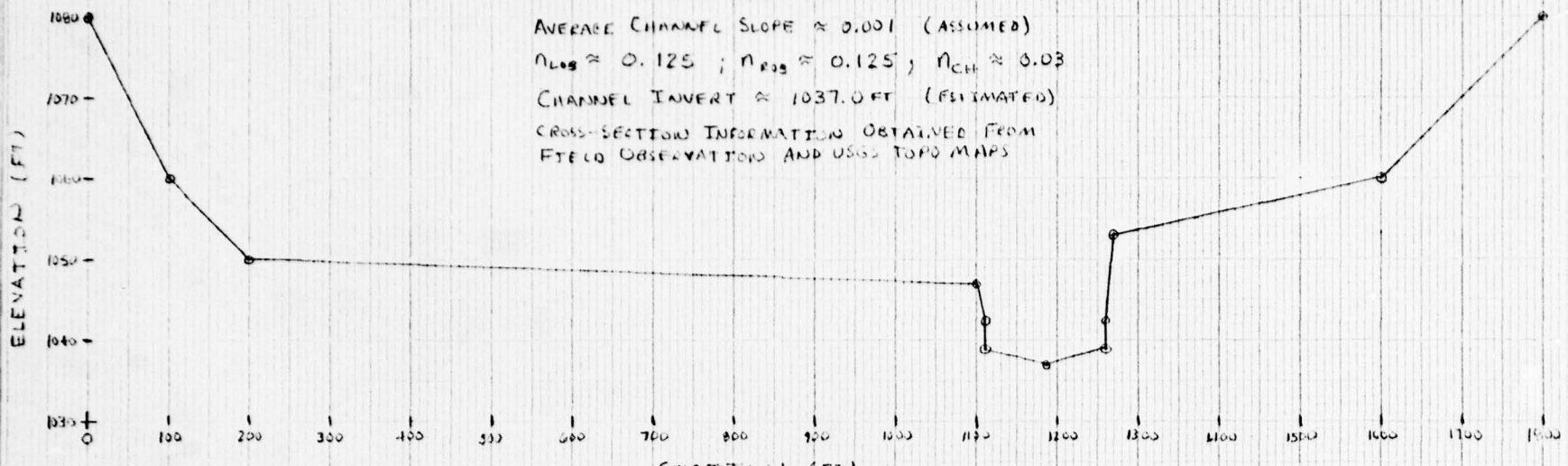
SECTION 2.0 ⇒ ≈ 1250' DS FROM UPPER DAM
AND ≈ 1150' US FROM LOWER DAM

AVERAGE CHANNEL SLOPE ≈ 0.001 (ASSUMED)

$n_{LOB} \approx 0.125$; $n_{ROB} \approx 0.125$; $n_{CH} \approx 0.03$

CHANNEL INVERT ≈ 1037.0 FT (ESTIMATED)

CROSS-SECTION INFORMATION OBTAINED FROM FIELD OBSERVATIONS AND USGS TOPO MAPS



SECTION 4.0 ⇒ LOWER BRIDGEPORT DAM SECTION ≈ 2,400 FT DS FROM UPPER DAM

AVERAGE CHANNEL SLOPE ≈ 0.001 (ASSUMED)

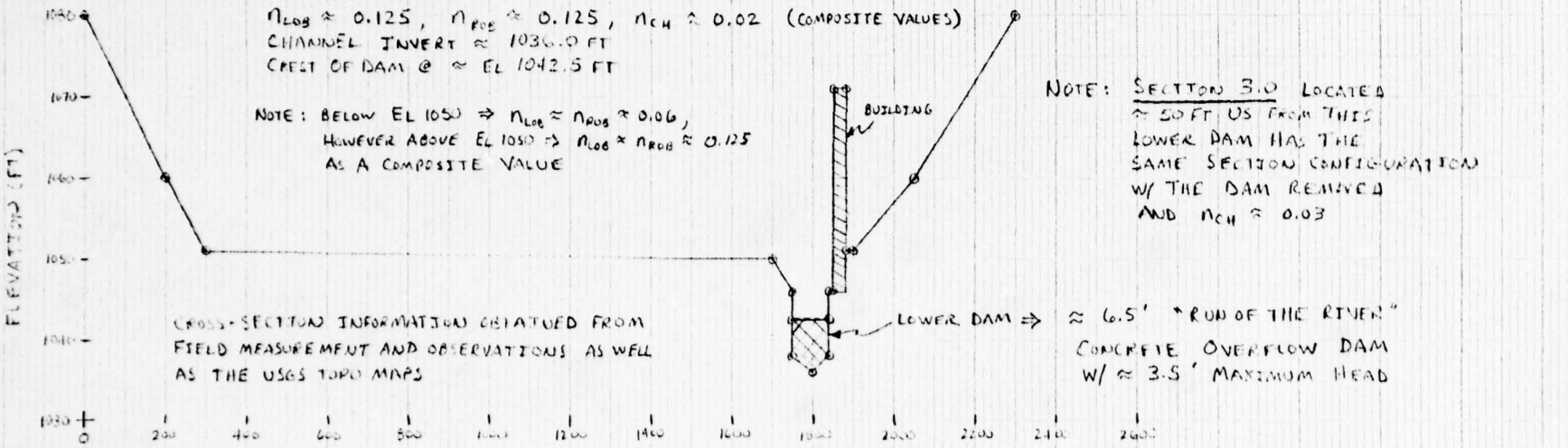
$n_{LOB} \approx 0.125$, $n_{ROB} \approx 0.125$, $n_{CH} \approx 0.02$ (COMPOSITE VALUES)

CHANNEL INVERT ≈ 1036.0 FT

CREST OF DAM @ ≈ EL 1042.5 FT

NOTE: BELOW EL 1050 ⇒ $n_{LOB} \approx n_{ROB} \approx 0.06$,
HOWEVER ABOVE EL 1050 ⇒ $n_{LOB} \approx n_{ROB} \approx 0.125$
AS A COMPOSITE VALUE

NOTE: SECTION 3.0 LOCATED ≈ 50 FT US FROM THIS LOWER DAM HAS THE SAME SECTION CONFIGURATION W/ THE DAM REMOVED AND $n_{CH} \approx 0.03$



SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

BY WJV DATE 6-4-79 PROJ. NO. 79-617-465

CHKD. BY DLB DATE 6-4-79 SHEET NO. 22 OF 26

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DOWNSTREAM ROUTING RELATIONSHIPS

STORAGE VS OUTFLOW INFORMATION FOR THE DOWNSTREAM ROUTING SECTIONS WAS OBTAINED FROM THE HEC-2 TAILWATER OUTPUT. (SEE SUMMARY INPUT / OUTPUT SHEETS, SHEETS A TO C).

- SECTION 1: LOCATED @ 1ST STRUCTURE @ 550 FT DS FROM UPPER BRIDGEPORT DAM (OR @ 1350 FT US FROM LOWER BRIDGEPORT DAM)

STORAGE (AC-FT)	OUTFLOW (CFS)	STORAGE (AC-FT)	OUTFLOW (CFS)
0	0	70.9	12790
6.1	280	82.2	16420
10.3	1450	94.1	20610
17.4	3140	106.3	25200
34.3	5300	119.2	30350
39.4	5920	132.3	35740
49.7	7390	151.9	43170
60.1	9740	174.1	55170
		198.6	62510

- SECTION 4: LOCATED @ LOWER BRIDGEPORT DAM @ 2100 FT DS FROM UPPER BRIDGEPORT DAM

STORAGE (AC-FT)	OUTFLOW (CFS)	STORAGE (AC-FT)	OUTFLOW (CFS)
0	0	263.8	12790
30.1	280	307.9	16420
44.1	1450	354.4	20610
65.7	3140	402.5	25200
116.4	5300	453.5	30350
136.6	5920	505.6	35740
190.0	7390	616.8	43170
221.4	9740	673.8	55170
		732.1	62510

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

BY WJV DATE 6-23-79 PROJ. NO. 78-617-465

CHKD. BY DLB DATE 6-22-79 SHEET NO. 23 OF 26

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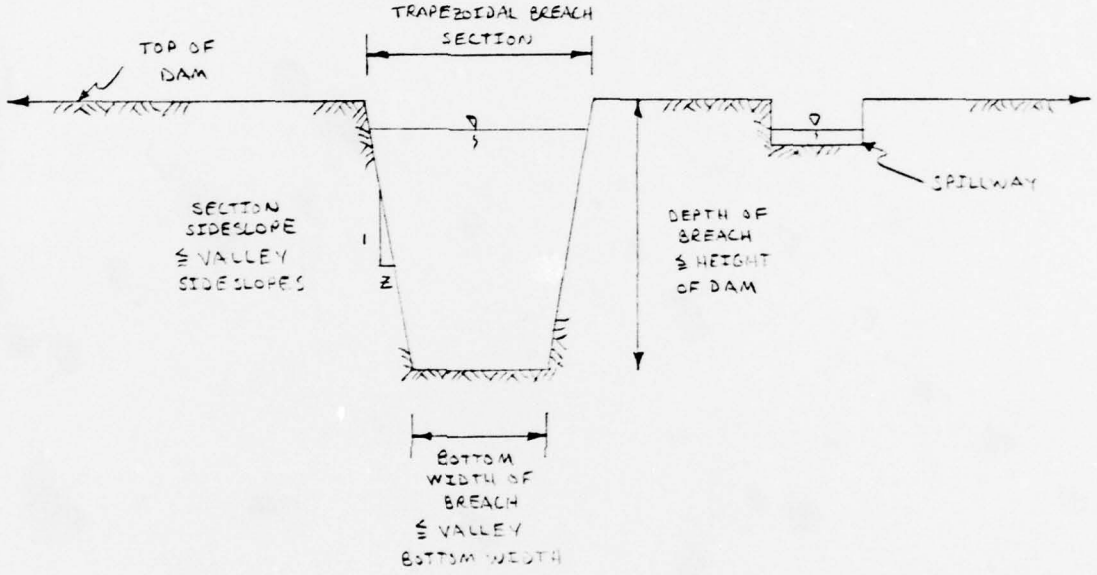
BREACHING ASSUMPTIONS

- TYPICAL BREACH SECTION :



- HEC-1- DAM BREACHING ANALYSIS INPUTS :

(BREACHING BEGINS WHEN RESERVOIR LEVEL REACHES THE TOP OF DAM ELEVATION)

PLAN NUMBER AND COMMENT	BREACH BOTTOM WIDTH (FT)	BREACH DEPTH (FT)	SECTION SIDESLOPES	* BREACH TIME (HR)	WSEL @ START OF FAILURE (FT)
① MIN BREACH SECT; MIN FAIL TIME	10	7	½ TO 1	0.75	1054.0
② MAX BREACH SECT; MIN FAIL TIME	460	7	4 TO 1	0.75	1054.0
③ MIN BREACH SECT; MAX FAIL TIME	10	7	½ TO 1	4.00	1059.0
④ MAX BREACH SECT; MAX FAIL TIME	460	7	4 TO 1	4.00	1059.0
⑤ AVERAGE POSSIBLE CONDITIONS	200	7	2 TO 1	1.50	1057.0
** ⑥ AVERAGE POSSIBLE CONDITIONS	200	7	2 TO 1	1.50	1057.0

* BREACH TIME = TOTAL TIME NECESSARY TO REACH FINAL BREACH DIMENSIONS

** PLANS ① → ⑤ EVALUATED UNDER 0.22 PMF, PLAN ⑥ EVALUATED UNDER 0.15 PMF

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

BY WJV DATE 6-23-79 PROJ. NO. 78-617-465

CHKD. BY DLB DATE 6-22-79 SHEET NO. 24 OF 26

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- THE ASSUMPTIONS OF SHEET 23 ARE BASED SOMEWHAT ON INFORMATION CONCERNING EARTH DAM BREACHING PROVIDED BY THE COE, BALTIMORE DISTRICT, AND ALSO ON THE PHYSICAL CONSTRAINTS OF THE DAM AND SURROUNDING TERRAIN:

CONSTRAINT	VALUE
- HEIGHT OF DAM	≈ 21 FT (FIELD MEASURED)
- APPROXIMATE ELEVATION OF TAILWATER ON DAM PRIOR TO BREACHING (CORRESPONDING TO DISCHARGE OF 7130 CFS)	≈ 1052.6 FT (FROM HEC-2 SHEET 19)
- EFFECTIVE POSSIBLE BREACH DEPTH BELOW LOW TOP OF DAM EL 1059.0 FT	≈ 7 FT
- EMBANKMENT CREST LENGTH:	
TO RIGHT OF EMERGENCY SPWY	≈ 320 FT (FIELD MEASURED)
BETWEEN SERVICE AND EMERGENCY SPWY.	≈ 200 FT (FIELD MEASURED)
TO LEFT OF SERVICE SPWY	≈ 150 FT (FIELD MEASURED)
- VALLEY BOTTOM WIDTH @ EL 1052.6 FT	≈ 1020 FT (FIELD MEASURED)
- VALLEY SIDESLOPES ADJACENT TO DAM:	
RIGHT SIDE	≈ 5.5 to 1 (SHEET 20)
LEFT SIDE	≈ 6 to 1

SUBJECT DAM SAFETY INSPECTIONS
UPPER BRIDGEPORT DAM
BY WJV DATE 6-25-79 PROJ. NO. 78-617-465
CHKD. BY DLB DATE 7-1-79 SHEET NO. 25 OF 26

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HEC-1-DAM BREACHING ANALYSIS OUTPUT :

RESERVOIR DATA

UNDER 0.22 PMF CONDITIONS (W/ PA-65 DAM ABLE TO PASS THE ENTIRE FLOOD WITHOUT BREACHING) -

* PLAN NUMBER	VARIABLE BREACH BOTTOM WIDTH (FT)	ACTUAL MAX FLOW DURING FAIL TIME (CFS)	CORRESPONDING TIME OF FLOW (HR)	INTERPOLATED OR HEC-1 ROUTED MAX FLOW DURING FAIL TIME (CFS)	CORRESPONDING TIME OF FLOW (HR)	ACTUAL PEAK FLOW THROUGH DAM (CFS)	CORRESPONDING TIME OF PEAK (HR)	TIME OF INITIAL BREACH (HR)
(1)	10	8326	43.50	8326	43.50	8326	43.50	42.75
(2)	160	18546	43.50	18546	43.50	18546	43.50	42.75
(3)	10	8023	44.17	8023	44.25	8023	44.17	42.75
(4)	160	9837	44.50	9837	44.50	9837	44.50	42.75
(5)	200	11890	44.25	11890	44.25	11890	44.25	42.75

UNDER 0.50 PMF BASE FLOW CONDITIONS (W/ PA-65 DAM ABLE TO PASS THE ENTIRE FLOOD WITHOUT BREACHING) -

* PLAN NUMBER	VARIABLE BREACH BOTTOM WIDTH (FT)	ACTUAL MAX FLOW DURING FAIL TIME (CFS)	CORRESPONDING TIME OF FLOW (HR)	INTERPOLATED OR HEC-1 ROUTED MAX FLOW DURING FAIL TIME (CFS)	CORRESPONDING TIME OF FLOW (HR)	ACTUAL PEAK FLOW THROUGH DAM (CFS)	CORRESPONDING TIME OF PEAK (HR)	TIME OF INITIAL BREACH (HR)
(6)	200	19065	41.75	19065	41.75	19693	43.50	40.25

* SEE TABLE A SHEET 23

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-25-79 PROJ. NO. 79-617-465
CHKD. BY DLR DATE 7-1-79 SHEET NO. 26 OF 26

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HEC-1- DAM BREACHING ANALYSIS OUTPUT :

DOWNSTREAM ROUTING DATA

UNDER 0.22 PMF BASE FLOW CONDITIONS (w/ PA-657 DAM ABLE TO PASS THE ENTIRE FLOOD WITHOUT BREACHING) -

PLAN [1.] NUMBER	VARIABLE BREACH BOTTOM WIDTH (FT)	OUTPUT @ SECTION 7 LOCATED 550FT DS FROM DAM: PEAK FLOW (CFS)	CORRESPONDING WSEL [2.] (FT)	WSEL [3.] W/O BREACH (FT)	[4.] Δ ELEV (FT)	OUTPUT @ SECTION 8 (LOWER BRIDGEPORT DAM SECTION): PEAK FLOW (CFS)	CORRESPONDING WSEL [2.] (FT)	WSEL [3.] W/O BREACH (FT)	[4.] Δ ELEV (FT)
①	10	8316	1053.1	1053.1	0.0	8229	1051.4	1051.3	+0.1
②	460	18227	1056.2	1053.1	+3.1	16454	1054.0	1051.3	+2.7
③	10	8023	1053.1	1053.1	0.0	8006	1051.3	1051.3	0.0
④	460	9936	1053.8	1053.1	+0.7	9794	1052.0	1051.3	+0.7
⑤	200	11891	1054.5	1053.1	+1.4	11652	1052.6	1051.3	+1.3

UNDER 0.50 PMF BASE FLOW CONDITIONS (w/ PA-657 DAM ABLE TO PASS THE ENTIRE FLOOD WITHOUT BREACHING) -

⑥	200	19692	1056.6	1056.6	0.0	19696	1054.8	1054.8	0.0

1.) SEE TABLE ON SHEET 23. 2.) WATER SURFACE ELEVATIONS CORRESPONDING TO THE BREACH OUTFLOWS AS INTERPOLATED FROM THE HEC-2 TAILWATER OUTPUT, SUMMARY INPUT/OUTPUT SHEETS, SHEETS B AND C. 3.) BASE FLOW ELEVATIONS CORRESPONDING TO THE PEAK 0.22 PMF FOR PLANS ① - ⑤, AND CORRESPONDING TO THE PEAK 0.5 PMF FOR PLAN ⑥ FROM OUTPUT OF HEC-2 ANALYSIS, SUMMARY INPUT/OUTPUT SHEETS. 4.) Δ ELEV = CORRESPONDING WSEL -

SUMMARY INPUT/OUTPUT SHEETS

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T1 DAM SAFETY INSPECTION - TAILWATER ON UPPER BRIDGEPORT DAM
T2 STARTING WSEL,S BASED ON HAND COMPUTED RATING CURVE FOR LOWER BRDPT DAM
T3      JACOB,S CREEK, BRIDGEPORT, PA

J1  ICHECK     INQ        NINV       IDIR       STRT       METRIC     HVINS      Q          WSEL       FQ
       0.        2.         0.         0.  0.0             0.0        0.0          0.  1043.500       0.0

J2  NPROF      IPLOT      PRFVS      XSECV      XSECH      FN         ALLDC      IBW        CHNIM      ITRACE
    1.000        0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0

J3  VARIABLE CODES FOR SUMMARY PRINTOUT
     38.000     39.000     42.000     43.000      1.000      2.000      3.000     26.000     25.000      7.000

J5  LPRNT      NUMSEC                        ********REQUESTED SECTION NUMBERS********
    -10.000    -10.000        0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0
NC      0.125      0.125      0.020      0.100      0.300        0.0        0.0        0.0        0.0        0.0
QT     14.000    280.000   1450.000   3140.000   5300.000   5920.000   7380.000   9740.000  12790.000  16420.000
QT  20610.000  25200.000  30350.000  35740.000  48170.000        0.0        0.0        0.0        0.0        0.0

X1      4.000     15.000   1750.000   1840.000        0.0        0.0        0.0        0.0        0.0        0.0
GR   1080.000      0.0      1060.000    200.000   1051.000    300.000   1050.000   1700.000   1046.000   1750.000
GR   1042.500   1750.000   1042.500   1840.000   1046.000   1840.000   1046.000   1850.000   1071.000   1850.000
GR   1071.000   1880.000   1051.000   1880.000   1051.000   1900.000   1060.000   2050.000   1080.000   2300.000
NC      0.125      0.125      0.030      0.300      0.500        0.0        0.0        0.0        0.0        0.0

X1      3.000     14.000   1750.000   1840.000     50.000     50.000     50.000        0.0        0.0        0.0
GR   1080.000      0.0      1060.000    200.000   1051.000    300.000   1050.000   1700.000   1046.000   1750.000
GR   1038.000   1750.000   1036.000   1800.000   1038.000   1840.000   1046.000   1840.000   1046.000   1850.000
GR   1051.000   1880.000   1051.000   1900.000   1060.000   2050.000   1080.000   2300.000        0.0        0.0
NC      0.125      0.125      0.030      0.100      0.300        0.0        0.0        0.0        0.0        0.0

X1      2.000     12.000   1110.000   1260.000    700.000   1250.000   1100.000        0.0        0.0        0.0
GR   1080.000      0.0      1060.000    100.000   1050.000    200.000   1047.000   1100.000   1042.500   1110.000
GR   1039.000   1110.000   1037.000   1185.000   1039.000   1260.000   1042.500   1260.000   1053.000   1270.000
GR   1060.000   1600.000   1080.000   1800.000        0.0        0.0        0.0        0.0        0.0        0.0
NC      0.090      0.125      0.030      0.300      0.500        0.0        0.0        0.0        0.0        0.0

X1      1.000     11.000    250.000    360.000    700.000    700.000    700.000        0.0        0.0        0.0
GR   1080.000      0.0      1060.000     75.000   1049.000    150.000   1042.500    250.000   1040.000    250.000
GR   1037.700    305.000   1040.000    360.000   1042.500    360.000   1048.000    400.000   1060.000   1100.000
GR   1080.000   1300.000        0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0
NC      0.090      0.125      0.030      0.100      0.300        0.0        0.0        0.0        0.0        0.0
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TAILWATER ON DAM AND DOWNSTREAM ROUTING CRITERIA VIA HEC-2

SUBJECT DAM SAFETY INSPECTION

UPPER BRIDGEPORT DAM

BY WJV DATE 6-27-79

CHKD. BY DLB DATE 6-29-79

PROJ. NO. 78-617-465

SHEET NO. A OF BB

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X1	0.0	12.000	150.000	250.000	550.000	550.000	550.000	0.0	0.0	0.0
GR	1080.000	0.0	1060.000	50.000	1042.500	150.000	1041.000	150.000	1038.200	200.000
GR	1041.000	250.000	1042.500	250.000	1048.000	300.000	1049.000	700.000	1050.000	970.000
GR	1059.000	1020.000	1080.000	1400.000	0.0	0.0	0.0	0.0	0.0	0.0
EJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 78-617-465
CHKD. BY DLB DATE 6-29-79 SHEET NO. 13 OF 22

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SUMMARY OUTPUT

FLOW VS ELEVATION — CUMULATIVE STORAGE VOLUME

SECNO	XLCH	ELMIN	Q	CWSEL	CRIWS	EG	VCH	AREA	VOL	
4.000	0.0	1042.50	280.00	1043.50	0.0	1043.65	3.11	90.00	0.0	LOWER BRIDGEPORT DAM SECTION
4.000	0.0	1042.50	1450.00	1045.50	0.0	1045.95	5.37	270.00	0.0	
4.000	0.0	1042.50	3140.00	1047.50	0.0	1048.25	6.95	479.06	0.0	
4.000	0.0	1042.50	5300.00	1049.50	0.0	1050.56	8.31	741.56	0.0	
4.000	0.0	1042.50	5920.00	1050.00	0.0	1051.14	8.64	815.00	0.0	
4.000	0.0	1042.50	7380.00	1051.00	1048.44	1052.26	9.23	1665.00	0.0	
4.000	0.0	1042.50	9740.00	1052.00	1051.10	1053.32	9.90	3248.89	0.0	
4.000	0.0	1042.50	12790.00	1053.00	0.0	1054.37	10.60	4860.55	0.0	
4.000	0.0	1042.50	16420.00	1054.00	0.0	1055.40	11.27	6500.00	0.0	
4.000	0.0	1042.50	20610.00	1055.00	0.0	1056.45	11.94	8167.22	0.0	
4.000	0.0	1042.50	25200.00	1056.00	0.0	1057.49	12.54	9862.22	0.0	
4.000	0.0	1042.50	30350.00	1057.00	0.0	1058.54	13.17	11585.00	0.0	
4.000	0.0	1042.50	35740.00	1058.00	0.0	1059.57	13.69	13335.55	0.0	
4.000	0.0	1042.50	48170.00	1060.00	0.0	1061.68	14.85	16920.00	0.0	
4.000	0.0	1042.50	55170.00	1061.00	0.0	1062.74	15.42	18751.25	0.0	
4.000	0.0	1042.50	62510.00	1062.00	0.0	1063.80	15.96	20605.00	0.0	
3.000	50.00	1036.00	280.00	1043.69	0.0	1043.70	0.46	602.31	0.40	≈ 50 FT US FROM LOWER BRIDGEPORT DAM
3.000	50.00	1036.00	1450.00	1046.03	0.0	1046.08	1.78	812.85	0.62	
3.000	50.00	1036.00	3140.00	1048.30	0.0	1048.45	3.07	1089.29	0.90	
3.000	50.00	1036.00	5300.00	1050.54	0.0	1050.82	4.26	1657.06	1.38	
3.000	50.00	1036.00	5920.00	1051.12	0.0	1051.42	4.45	2434.22	1.86	
3.000	50.00	1036.00	7380.00	1052.29	0.0	1052.58	4.66	4315.56	3.43	
3.000	50.00	1036.00	9740.00	1053.31	0.0	1053.65	5.23	6006.00	5.31	
3.000	50.00	1036.00	12790.00	1054.30	0.0	1054.69	5.90	7658.57	7.18	
3.000	50.00	1036.00	16420.00	1055.28	0.0	1055.73	6.57	9331.43	9.09	
3.000	50.00	1036.00	20610.00	1056.28	0.0	1056.77	7.21	11055.97	11.03	
3.000	50.00	1036.00	25200.00	1057.27	0.0	1057.81	7.79	12804.05	13.01	
3.000	50.00	1036.00	30350.00	1058.28	0.0	1058.86	8.34	14622.51	15.04	
3.000	50.00	1036.00	35740.00	1059.29	0.0	1059.90	8.81	16449.70	17.09	
3.000	50.00	1036.00	48170.00	1061.37	0.0	1062.03	9.69	20304.82	21.36	
3.000	50.00	1036.00	55170.00	1062.41	0.0	1063.10	10.12	22279.75	23.55	
3.000	50.00	1036.00	62510.00	1063.45	0.0	1064.17	10.52	24278.68	25.76	

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

BY WJY DATE 6-27-79 PROJ. NO. 78-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. C OF BB

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FLOW vs ELEVATION

CUMULATIVE STORAGE VOLUME

SECNO	XLCH	ELMIN	Q	CWSEL	CRIWS	EG	VCH	AREA	VOL	
2.000	1100.00	1037.00	280.00	1043.70	0.0	1043.70	0.33	857.32	18.82	≈ 1150 FT US FROM LOWER BRIDGEPORT DAM
2.000	1100.00	1037.00	1450.00	1046.12	0.0	1046.14	1.19	1238.54	26.47	
2.000	1100.00	1037.00	3140.00	1048.52	0.0	1048.58	1.96	1977.83	37.81	
2.000	1100.00	1037.00	5300.00	1050.91	0.0	1050.99	2.50	4199.29	63.80	
2.000	1100.00	1037.00	5920.00	1051.51	0.0	1051.60	2.59	4849.71	76.61	
2.000	1100.00	1037.00	7380.00	1052.66	0.0	1052.76	2.82	6103.05	105.23	
2.000	1100.00	1037.00	9740.00	1053.72	0.0	1053.86	3.31	7290.67	132.12	
2.000	1100.00	1037.00	12790.00	1054.76	0.0	1054.94	3.91	8505.97	159.27	
2.000	1100.00	1037.00	16420.00	1055.79	0.0	1056.03	4.55	9767.12	187.38	
2.000	1100.00	1037.00	20610.00	1056.81	0.0	1057.11	5.20	11089.59	216.87	
2.000	1100.00	1037.00	25200.00	1057.82	0.0	1058.19	5.83	12447.00	247.24	
2.000	1100.00	1037.00	30350.00	1058.84	0.0	1059.28	6.46	13881.30	279.33	
2.000	1100.00	1037.00	35740.00	1059.84	0.0	1060.34	7.04	15339.04	312.03	
2.000	1100.00	1037.00	48170.00	1061.88	0.0	1062.52	8.17	18424.95	381.62	
2.000	1100.00	1037.00	55170.00	1062.91	0.0	1063.62	8.73	19993.75	417.30	
2.000	1100.00	1037.00	62510.00	1063.94	0.0	1064.72	9.24	21610.92	453.80	
1.000	700.00	1037.70	280.00	1043.70	0.0	1043.71	0.52	550.48	30.13	≈ 1850 FT US FROM LOWER BRIDGEPORT DAM; ≈ 550 FT DS FROM UPPER BRIDGEPORT DAM
1.000	700.00	1037.70	1450.00	1046.15	0.0	1046.19	1.76	954.64	44.09	
1.000	700.00	1037.70	3140.00	1048.56	0.0	1048.68	2.78	1492.90	65.70	
1.000	700.00	1037.70	5300.00	1050.95	0.0	1051.13	3.57	2345.57	116.39	
1.000	700.00	1037.70	5920.00	1051.55	0.0	1051.74	3.75	2617.63	136.61	
1.000	700.00	1037.70	7380.00	1052.69	0.0	1052.92	4.16	3202.77	180.00	
1.000	700.00	1037.70	9740.00	1053.76	0.0	1054.08	4.95	3824.32	221.43	
1.000	700.00	1037.70	12790.00	1054.79	0.0	1055.23	5.91	4499.29	263.76	
1.000	700.00	1037.70	16420.00	1055.81	0.0	1056.40	6.93	5232.13	307.89	
1.000	700.00	1037.70	20610.00	1056.83	0.0	1057.59	7.98	6030.14	354.43	
1.000	700.00	1037.70	25200.00	1057.82	0.0	1058.76	8.99	6875.70	402.50	
1.000	700.00	1037.70	30350.00	1058.82	0.0	1059.96	9.99	7794.84	453.50	
1.000	700.00	1037.70	35740.00	1059.80	0.0	1061.12	10.92	8750.00	505.58	
1.000	700.00	1037.70	48170.00	1061.82	0.0	1063.46	12.54	10846.16	616.81	
1.000	700.00	1037.70	55170.00	1062.84	0.0	1064.63	13.32	11925.02	673.76	
1.000	700.00	1037.70	62510.00	1063.87	0.0	1065.80	14.04	13020.94	732.06	
0.0	550.00	1038.20	280.00	1043.71	0.0	1043.72	0.68	421.75	36.27	@ TOE OF UPPER BRIDGEPORT DAM
0.0	550.00	1038.20	1450.00	1046.20	0.0	1046.27	2.16	759.58	54.91	
0.0	550.00	1038.20	3140.00	1048.64	0.0	1048.80	3.33	1257.63	83.06	
0.0	550.00	1038.20	5300.00	1051.05	0.0	1051.26	3.94	3089.11	150.70	
0.0	550.00	1038.20	5920.00	1051.66	0.0	1051.87	4.02	3623.19	176.01	
0.0	550.00	1038.20	7380.00	1052.84	0.0	1053.05	4.26	4667.44	229.69	
0.0	550.00	1038.20	9740.00	1053.97	0.0	1054.24	4.86	5692.09	281.50	
0.0	550.00	1038.20	12790.00	1055.11	0.0	1055.44	5.60	6729.53	334.65	
0.0	550.00	1038.20	16420.00	1056.25	0.0	1056.66	6.37	7787.43	390.09	
0.0	550.00	1038.20	20610.00	1057.41	0.0	1057.90	7.15	8873.32	448.52	
0.0	550.00	1038.20	25200.00	1058.54	0.0	1059.13	7.90	9959.66	508.78	
0.0	550.00	1038.20	30350.00	1059.70	0.0	1060.38	8.64	11079.80	572.65	
0.0	550.00	1038.20	35740.00	1060.82	0.0	1061.59	9.31	12198.07	637.83	
0.0	550.00	1038.20	48170.00	1063.04	0.0	1064.00	10.71	14479.52	776.69	
0.0	550.00	1038.20	55170.00	1064.15	0.0	1065.21	11.41	15656.65	847.89	
0.0	550.00	1038.20	62510.00	1065.25	0.0	1066.41	12.08	16847.29	920.62	

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 79-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. D OF 23

OVERTOPPING ANALYSIS

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DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM W/ US PA-657 DAM + DS LOWER BRIDGEPORT DAM *OVERTOPPING*
15-MINUTE TIME STEP AND 48-HOUR STORM DURATION

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	15	0	0	0	0	0	0	0
			JOPER	NWT	LKOPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 5 LRTIO= 1
RTIOS= .10 .20 .30 .50 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW INTO PA-657 RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	2.60	0.00	31.50	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	24.00	90.00	108.00	118.00	128.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .837

INITIAL AND CONSTANT RAINFALL & LOSSES, AS PER COE

LOSS DATA

LKOPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 1.54 CP= .40 NTA= 0

BASE FLOW PARAMETERS AS PER COE

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 6.53 AND R=11.49 INTERVALS

UNIT HYDROGRAPH 65 END-OF-PERIOD ORDINATES, LAG= 1.55 HOURS, CP= .40 VOL= 1.00

24.	89.	181.	283.	371.	426.	436.	409.	375.	343.
315.	288.	264.	242.	222.	204.	187.	171.	157.	144.
132.	121.	111.	101.	93.	85.	78.	72.	66.	60.
55.	51.	46.	42.	39.	36.	33.	30.	27.	25.
23.	21.	19.	18.	16.	15.	14.	13.	11.	11.
10.	9.	8.	7.	7.	6.	6.	5.	5.	4.
4.	4.	3.	3.	3.					

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 79-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. E OF 28

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END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	25.71	23.27	2.44	156730.
										(653.)	(591.)	(62.)	(4438.10)

PA-657 DAM LOCAL INFLOW HYDROGRAPHS

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5170.	3809.	1541.	544.	156731.
CMS	146.	108.	44.	15.	4438.
INCHES		13.63	22.05	23.36	23.36
MM		346.18	560.09	593.47	593.47
AC-FT		1889.	3056.	3238.	3238.
THOUS CU M		2330.	3770.	3994.	3994.

0.2 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1034.	762.	308.	109.	31346.
CMS	29.	22.	9.	3.	888.
INCHES		2.73	4.41	4.67	4.67
MM		69.24	112.02	118.69	118.69
AC-FT		378.	611.	648.	648.
THOUS CU M		466.	754.	799.	799.

0.5 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2585.	1905.	770.	272.	78366.
CMS	73.	54.	22.	8.	2219.
INCHES		6.81	11.03	11.68	11.68
MM		173.09	280.05	296.73	296.73
AC-FT		944.	1528.	1619.	1619.
THOUS CU M		1165.	1885.	1997.	1997.

HYDROGRAPH ROUTING

ROUTE THROUGH PA-657 RESERVOIR

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
101	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	93.	1

CAPACITY=	0.	93.	140.	240.	360.	460.	740.	1100.	1540.
ELEVATION=	1818.	1828.	1829.	1832.	1834.	1835.	1838.	1841.	1844.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1835.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0

IABCOA	ISPITW	ISPCTW
0	0	0

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 78-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. F OF BP

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					SS	NGATES	DESND	APEL	APWID	APLOSS	PDPTH
					2.75	1	9.4	0.0	0.0	0.0	0.0
1816.00	0.	0.	0.0	0.	0.	0.0	0.	0.	0.		
1827.50	93.	0.	0.0	0.	0.	0.0	0.	0.	0.		
1829.30	140.	0.	0.0	0.	0.	0.0	0.	0.	0.		
1831.50	240.	0.	0.0	0.	0.	0.0	0.	0.	0.		
1833.50	360.	0.	0.0	0.	0.	0.0	0.	0.	0.		
1835.00	460.	0.	0.0	0.	0.	0.0	0.	0.	0.		
1838.20	740.	1864.	2.2	1864.	0.	0.0	0.	1864.	1864.		
1841.20	1100.	5242.	4.3	5242.	0.	0.0	0.	5242.	5242.		
1844.40	1540.	10182.	6.6	10182.	0.	0.0	0.	10182.	10182.		

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1844.4	0.0	0.0	0.

PA-657 DAM OUTFLOW HYDROGRAPHS

PEAK OUTFLOW IS 4413. AT TIME 42.75 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4413.	3574.	1439.	482.	138955.
CMS	125.	101.	41.	14.	3935.
INCHES		12.79	20.59	20.71	20.71
MM		324.81	522.93	526.16	526.16
AC-FT		1772.	2853.	2871.	2871.
THOUS CU M		2186.	3520.	3541.	3541.

PMF

PEAK OUTFLOW IS 493. AT TIME 44.75 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	493.	397.	141.	47.	13574.
CMS	14.	11.	4.	1.	384.
INCHES		1.42	2.02	2.02	2.02
MM		36.05	51.31	51.40	51.40
AC-FT		197.	280.	280.	280.
THOUS CU M		243.	345.	346.	346.

0.2 PMF

PEAK OUTFLOW IS 2029. AT TIME 43.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2029.	1658.	630.	210.	60598.
CMS	57.	47.	18.	6.	1716.
INCHES		5.93	9.01	9.03	9.03
MM		150.67	228.84	229.45	229.45
AC-FT		822.	1249.	1252.	1252.
THOUS CU M		1014.	1540.	1544.	1544.

0.5 PMF

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 79-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. 6 OF 28

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HYDROGRAPH ROUTING

ROUTE FROM PA-657 DAM TO SECTION A-A @ 2300 FT DS FROM PA-657 DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
102	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP		LSTR
0.0	0.000	0.00	1	1	0	0		0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELEVI	ELMAX	RLNTH	SEL
.0900	.0300	.0700	1796.0	1820.0	2300.	.01400

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0.00 1820.00 250.00 1810.00 500.00 1800.00 505.00 1796.00 515.00 1796.00
520.00 1800.00 660.00 1810.00 800.00 1820.00

STORAGE	0.00	.77	1.76	2.95	5.42	11.14	20.14	32.42	47.99
	86.99	114.42	143.14	175.14	210.42	248.99	290.85	335.99	384.42
OUTFLOW	0.00	66.31	293.08	608.25	1139.66	1992.30	3281.68	5111.81	7575.38
	14739.11	19595.29	25398.92	32219.76	40125.19	49180.48	59449.03	70992.62	83871.51
STAGE	1796.00	1797.26	1798.53	1799.79	1801.05	1802.32	1803.58	1804.84	1806.11
	1807.63	1809.89	1811.16	1812.42	1813.68	1814.95	1816.21	1817.47	1818.74
FLOW	0.00	66.31	293.08	608.25	1139.66	1992.30	3281.68	5111.81	7575.38
	14739.11	19595.29	25398.92	32219.76	40125.19	49180.48	59449.03	70992.62	83871.51

FLOW @ 2300 FT DS FROM PA-657 DAM

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4409.	3574.	1439.	482.	138954.
CMS	125.	101.	41.	14.	3935.
INCHES		12.79	20.59	20.71	20.71
MM		324.77	522.93	526.15	526.15
AC-FT		1772.	2853.	2871.	2871.
THOUS CU M		2186.	3520.	3541.	3541.

PMF

MAXIMUM STORAGE = 28.

MAXIMUM STAGE IS 1804.4

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJY DATE 6-27-79 PROJ. NO. 78-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. 11 OF 38

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	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	493.	397.	141.	47.	13574.
CMS	14.	11.	4.	1.	384.
INCHES		1.42	2.02	2.02	2.02
MM		36.05	51.31	51.40	51.40
AC-FT		197.	280.	280.	280.
THOUS CU M		243.	345.	346.	346.

0.2 PMF

MAXIMUM STORAGE = 3.

FLOWS @ 2300 FT DS FROM PA-657 DAM

MAXIMUM STAGE IS 1799.3

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2030.	1658.	629.	210.	60597.
CMS	57.	47.	18.	6.	1716.
INCHES		5.93	9.01	9.03	9.03
MM		150.66	228.82	229.45	229.45
AC-FT		822.	1249.	1252.	1252.
THOUS CU M		1014.	1540.	1544.	1544.

0.5 PMF

MAXIMUM STORAGE = 11.

MAXIMUM STAGE IS 1802.4

HYDROGRAPH ROUTING

ROUTE FROM SECTION A-A TO SECTION B-B * 7900 FT DS FROM PA-657 DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
203	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP		LSTR
0.0	0.000	0.00	1	1	0	0		0
	NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
	1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0300	.0800	1760.0	1800.0	5600.	.00300

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJY DATE 6-27-79 PROJ. NO. 79-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. I OF 12

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CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0.00 1800.00 200.00 1780.00 650.00 1763.00 655.00 1760.00 665.00 1760.00
670.00 1763.00 800.00 1780.00 1000.00 1800.00

STORAGE	0.00	3.66	12.11	38.42	84.17	149.36	233.99	338.06	461.57
	765.91	939.69	1124.87	1321.45	1529.42	1748.79	1979.55	2221.71	2475.27
OUTFLOW	0.00	104.24	428.67	1199.02	2641.95	4951.11	8297.82	12839.30	18722.59
	35473.90	46920.41	60023.47	74809.98	91312.97	109569.51	129619.32	151503.94	175266.13
STAGE	1760.00	1762.11	1764.21	1766.32	1768.42	1770.53	1772.63	1774.74	1776.84
	1781.05	1783.16	1785.26	1787.37	1789.47	1791.58	1793.68	1795.79	1797.89
FLOW	0.00	104.24	428.67	1199.02	2641.95	4951.11	8297.82	12839.30	18722.59
	35473.90	46920.41	60023.47	74809.98	91312.97	109569.51	129619.32	151503.94	175266.13

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME	
CFS	4369.	3554.	1438.	482.	138950.	
CMS	124.	101.	41.	14.	3935.	
INCHES		12.71	20.58	20.71	20.71	
MM		322.94	522.70	526.14	526.14	
AC-FT		1762.	2852.	2871.	2871.	
THOUS CU M		2174.	3518.	3541.	3541.	PMF

MAXIMUM STORAGE = 133.

MAXIMUM STAGE IS 1770.0

FLOWS @ 1430 FT DS FROM RR-657 DAM

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME	
CFS	485.	393.	141.	47.	13573.	
CMS	14.	11.	4.	1.	384.	
INCHES		1.41	2.02	2.02	2.02	
MM		35.71	51.29	51.39	51.39	
AC-FT		195.	280.	280.	280.	0.2PMF
THOUS CU M		240.	345.	346.	346.	

MAXIMUM STORAGE = 14.

MAXIMUM STAGE IS 1764.4

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME	
CFS	1999.	1645.	629.	210.	60595.	
CMS	57.	47.	18.	6.	1716.	
INCHES		5.89	9.01	9.03	9.03	
MM		149.50	228.75	229.44	229.44	
AC-FT		816.	1248.	1252.	1252.	0.5 PMF
THOUS CU M		1006.	1540.	1544.	1544.	

MAXIMUM STAGE IS [illegible] MAXIMUM STORAGE = 64

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 78-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. J OF 33

HYDROGRAPH ROUTING

ROUTE FROM SECTION B-B TO SECTION C-C * 31700 FT DS FROM PA-657 DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
304	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP		LSTR
0.0	0.000	0.00	1	1	0	0		0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELMVT	ELMAX	RLNTH	SEL
.1200	.0350	.1200	1280.0	1320.0	23800.	.03100

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0.00 1320.00 250.00 1300.00 350.00 1284.00 355.00 1280.00 365.00 1280.00
370.00 1284.00 450.00 1300.00 550.00 1320.00

STORAGE	0.00	14.53	35.22	74.57	141.16	235.00	356.08	504.40	679.97
	1114.72	1387.15	1701.96	2059.14	2458.71	2900.65	3384.97	3911.67	4480.74
OUTFLOW	0.00	271.37	959.76	2295.75	4281.45	7019.98	10604.50	15122.61	20657.79
	34831.13	43550.01	53867.25	65891.67	79737.90	95521.03	113354.63	133350.08	155616.35
STAGE	1280.00	1282.11	1284.21	1286.32	1288.42	1290.53	1292.63	1294.74	1296.84
	1301.05	1303.16	1305.26	1307.37	1309.47	1311.58	1313.68	1315.79	1317.89
FLOW	0.00	271.37	959.76	2295.75	4281.45	7019.98	10604.50	15122.61	20657.79
	34831.13	43550.01	53867.25	65891.67	79737.90	95521.03	113354.63	133350.08	155616.35

FLOW @ 31700 FT DS FROM PA-657 DAM

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4309.	3532.	1437.	482.	138943.
CMS	122.	100.	41.	14.	3934.
INCHES		12.64	20.56	20.71	20.71
MM		320.97	522.28	526.11	526.11
AC-FT		1751.	2850.	2871.	2871.
THOUS CU M		2160.	3515.	3541.	3541.

PME

MAXIMUM STORAGE = 142.

MAXIMUM STAGE IS 1288.4

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SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 79-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. K OF 33

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	478.	383.	141.	47.	13572.
CMS	14.	11.	4.	1.	384.
INCHES		1.37	2.02	2.02	2.02
MM		34.83	51.27	51.39	51.39
AC-FT		190.	280.	280.	280.
THOUS CU M		234.	345.	346.	346.

0.2 PMF

MAXIMUM STORAGE = 21.

FLOWS @ 31700 FT DS FROM PA-657 DAM

MAXIMUM STAGE IS 1282.7

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1977.	1635.	629.	210.	60591.
CMS	56.	46.	18.	6.	1716.
INCHES		5.85	9.00	9.03	9.03
MM		148.61	228.64	229.43	229.43
AC-FT		811.	1248.	1252.	1252.
THOUS CU M		1000.	1539.	1544.	1544.

0.5 PMF

MAXIMUM STORAGE = 65.

MAXIMUM STAGE IS 1285.8

HYDROGRAPH ROUTING

ROUTE FROM SECTION C-C TO SECTION D-D = 46500 FT DS FROM PA-657 DAM

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
405	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.1000	.0300	.1100	1060.0	1100.0	14800.	.01000

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0.00 1100.00 500.00 1080.00 1500.00 1063.00 1505.00 1060.00 1515.00 1060.00
1520.00 1063.00 1650.00 1080.00 1750.00 1100.00

SUBJECT DAM SAFETY INSPECTION

UPPER BRIDGEPORT DAM

BY WJV DATE 6-27-79 PROJ. NO. 78-617-465

CHKD. BY DLB DATE 7-2-79 SHEET NO. 1 OF 123

STORAGE	0.00	9.66	40.06	161.97	383.98	706.08	1128.27	1650.56	2272.95
	3011.15	4678.91	5591.84	6549.95	7553.23	8601.69	9695.33	10834.14	12016.13
OUTFLOW	0.00	190.32	797.03	2400.54	5607.88	10920.98	18781.73	29594.37	43736.16
	84715.71	113160.49	145532.51	181854.64	222167.56	266524.20	314986.04	367620.70	424500.28
STAGE	1060.00	1062.11	1064.21	1066.32	1068.42	1070.53	1072.63	1074.74	1076.84
	1081.05	1083.16	1085.26	1087.37	1089.47	1091.58	1093.68	1095.79	1097.89
FLOW	0.00	190.32	797.03	2400.54	5607.88	10920.98	18781.73	29594.37	43736.16
	84715.71	113160.49	145532.51	181854.64	222167.56	266524.20	314986.04	367620.70	424500.28

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME	
CFS	4100.	3436.	1436.	482.	138934.	
CMS	116.	97.	41.	14.	3934.	
INCHES		12.29	20.55	20.71	20.71	
MM		312.24	521.95	526.08	526.08	
AC-FT		1704.	2848.	2871.	2871.	PMF
THOUS CU M		2102.	3513.	3541.	3541.	

MAXIMUM STORAGE = 280.

MAXIMUM STAGE IS 1067.4

FLOWS @ 46500 FT DS FROM PA-65T DAM

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME	
CFS	460.	375.	141.	47.	13570.	
CMS	13.	11.	4.	1.	384.	
INCHES		1.34	2.02	2.02	2.02	
MM		34.10	51.25	51.38	51.38	
AC-FT		186.	280.	280.	280.	0.2 PMF
THOUS CU M		229.	345.	346.	346.	

MAXIMUM STORAGE = 23.

MAXIMUM STAGE IS 1063.0

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1858.	1587.	629.	210.	60587.
CMS	53.	45.	18.	6.	1716.
INCHES		5.68	9.00	9.03	9.03
MM		144.18	228.54	229.41	229.41

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SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 78-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. M OF BB

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SUB-AREA RUNOFF COMPUTATION

LOCAL INFLOW INTO UPPER BRIDGEPORT RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	28.90	0.00	31.50	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	24.00	90.00	108.00	118.00	128.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .837

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 3.30 CP= .40 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=13.64 AND R=24.54 INTERVALS

UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG= 3.33 HOURS, CP= .40 VOL= .98

42.	158.	328.	531.	760.	1009.	1276.	1539.	1775.	1974.
2134.	2251.	2319.	2313.	2242.	2153.	2067.	1984.	1905.	1829.
1756.	1686.	1618.	1554.	1492.	1432.	1375.	1320.	1267.	1217.
1168.	1122.	1077.	1034.	993.	953.	915.	878.	843.	810.
777.	746.	716.	688.	660.	634.	609.	584.	561.	539.
517.	496.	477.	458.	439.	422.	405.	389.	373.	358.
344.	330.	317.	304.	292.	281.	269.	259.	248.	238.
229.	220.	211.	203.	194.	187.	179.	172.	165.	159.
152.	146.	140.	135.	129.	124.	119.	114.	110.	106.
101.	97.	93.	90.	86.	83.	79.	76.	73.	70.

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	25.71	23.27	2.44	1704191.
										(653.)	(591.)	(62.)	(48257.32)

LOCAL INFLOW INTO UPPER BRIDGEPORT DAM RESERVOIR

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	36921.	31561.	16031.	5917.	1704104.
CMS	1045.	894.	454.	168.	48255.
INCHES		10.16	20.64	22.85	22.85
MM		258.04	524.28	580.51	580.51
AC-FT		15650.	31798.	35209.	35209.
THOUS CU M		19304.	39222.	43429.	43429.

PMF

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 78-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. N OF PB

LOCAL INFLOWS INTO UPPER BRIDGEPORT DAM RESERVOIR

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME	
CFS	7384.	6312.	3206.	1183.	340821.	
CMS	209.	179.	91.	34.	9651.	
INCHES		2.03	4.13	4.57	4.57	
MM		51.61	104.86	116.10	116.10	0.2 PMF
AC-FT		3130.	6360.	7042.	7042.	
THOUS CU M		3861.	7844.	8686.	8686.	
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME	
CFS	18460.	15781.	8016.	2959.	852052.	
CMS	523.	447.	227.	84.	24127.	
INCHES		5.08	10.32	11.43	11.43	0.5 PMF
MM		129.02	262.14	290.26	290.26	
AC-FT		7825.	15899.	17604.	17604.	
THOUS CU M		9652.	19611.	21715.	21715.	

COMBINE HYDROGRAPHS

COMBINE LOCAL INFLOW HYDROGRAPH W/ ROUTED PA-657 OUTFLOW HYDROGRAPH

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6	2	0	0	0	0	1	0	0

TOTAL INFLOW HYDROGRAPHS INTO UPPER BRIDGEPORT DAM RESERVOIR

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME	
CFS	40433.	34850.	17454.	6399.	1843038.	
CMS	1145.	987.	494.	181.	52189.	
INCHES		10.29	20.62	22.68	22.68	
MM		261.40	523.69	576.02	576.02	PMF
AC-FT		17281.	34620.	38079.	38079.	
THOUS CU M		21316.	42703.	46970.	46970.	
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME	
CFS	7394.	6504.	3343.	1231.	354391.	
CMS	209.	184.	95.	35.	10035.	
INCHES		1.92	3.95	4.36	4.36	0.2 PMF
MM		48.79	100.29	110.76	110.76	
AC-FT		3225.	6630.	7322.	7322.	
THOUS CU M		3978.	8178.	9032.	9032.	
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME	
CFS	19875.	17207.	8634.	3169.	912639.	
CMS	563.	487.	244.	90.	25843.	
INCHES		5.08	10.20	11.23	11.23	0.5 PMF
MM		129.07	259.06	285.23	285.23	
AC-FT		8532.	17126.	18856.	18856.	
THOUS CU M		10524.	21125.	23259.	23259.	

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 78-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. 8 OF 38

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HYDROGRAPH ROUTING

ROUTE COMBINED HYDROGRAPH THROUGH UPPER BRIDGEPORT RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
606	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	530.	-1

STAGE	1053.50	1054.50	1055.50	1056.50	1057.50	1058.50	1059.00	1059.50	1060.00
	1061.00	1061.50	1062.00	1063.00	1064.00	1065.00			
FLOW	0.00	310.00	910.00	1730.00	3390.00	5790.00	7130.00	8730.00	10780.00
	16270.00	19790.00	23770.00	32000.00	39950.00	41680.00			
CAPACITY=	0.	2.	12.	42.	99.	192.	332.	530.	570.	670.
	790.	930.	1080.	1250.	1440.	1650.	1880.	2130.	2390.	2670.
ELEVATION=	1040.	1042.	1044.	1046.	1048.	1050.	1052.	1054.	1054.	1055.
	1056.	1057.	1058.	1059.	1060.	1061.	1062.	1063.	1064.	1065.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1053.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1059.0	0.0	0.0	0.

UPPER BRIDGEPORT DAM OUTFLOW HYDROGRAPHS

PMF

PEAK OUTFLOW IS 39957. AT TIME 43.75 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	39957.	34706.	17426.	6386.	1839107.
CMS	1131.	983.	493.	181.	52078.
INCHES		10.25	20.58	22.63	22.63
MM		260.33	522.85	574.79	574.79
AC-FT		17210.	34564.	37998.	37998.
THOUS CU M		21228.	42634.	46870.	46870.

OVERTOPPING Q ≈ 0.2 PMF

PEAK OUTFLOW IS 7126. AT TIME 44.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7126.	6369.	3312.	1227.	353342.
CMS	202.	180.	94.	35.	10006.
INCHES		1.88	3.91	4.35	4.35
MM		47.77	99.37	110.43	110.43
AC-FT		3158.	6569.	7300.	7300.
THOUS CU M		3895.	8103.	9005.	9005.

0.2 PMF

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 78-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. P OF 82

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UPPER BRIDGEPORT DAM OUTFLOW HYDROGRAPH

PEAK OUTFLOW IS 19653. AT TIME 43.75 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	19653.	17073.	8601.	3160.	910195.
CMS	556.	483.	244.	89.	25774.
INCHES		5.04	10.16	11.20	11.20
MM		128.06	258.06	284.47	284.47
AC-FT		8466.	17060.	18806.	18806.
THOUS CU M		10442.	21043.	23196.	23196.

0.5 PMF

HYDROGRAPH ROUTING

ROUTE FROM UPPER BRIDGEPORT DAM TO SECTION 1.0 * 550 FT DS FROM U.B. DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
607	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

STORAGE	0.00	6.10	10.80	17.40	34.30	39.40	49.70	60.10	70.90
	94.10	106.30	119.20	132.30	159.90	174.10	188.60		
OUTFLOW	0.00	280.00	1450.00	3140.00	5300.00	5920.00	7380.00	9740.00	12790.00
	20610.00	25200.00	30350.00	35740.00	48170.00	55170.00	62510.00		

FLOWS @ 550 FT DS FROM UPPER BRIDGEPORT DAM (SECTION 7)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	19657.	17071.	8601.	3160.	909982.
CMS	557.	483.	244.	89.	25768.
INCHES		5.04	10.16	11.20	11.20
MM		128.05	258.05	284.40	284.40
AC-FT		8465.	17059.	18801.	18801.
THOUS CU M		10441.	21042.	23191.	23191.

PMF

MAXIMUM STORAGE = 91.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7125.	6367.	3312.	1227.	353234.
CMS	202.	180.	94.	35.	10002.
INCHES		1.88	3.91	4.35	4.35
MM		47.76	99.37	110.40	110.40
AC-FT		3157.	6564.	7298.	7298.
THOUS CU M		3914.	8103.	9002.	9002.

0.2 PMF

MAXIMUM STORAGE = 48.

SUBJECT DAM SAFETY INSPECTION — UPPER BRIDGEPORT DAM

BY WJV DATE 6-27-79 PROJ. NO. 78-617-465

CHKD. BY DLB DATE 7-2-79 SHEET NO. 8 OF 8B

FLOW @ 550 FT DS FROM UPPER BRIDGEPORT DAM (SECTION 7)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	39968.	34701.	17425.	6385.	1838812.
CMS	1132.	983.	493.	181.	52069.
INCHES		10.25	20.58	22.63	22.63
MM		260.29	522.83	574.70	574.70
AC-FT		17207.	34563.	37992.	37992.
THOUS CU M		21225.	42633.	46862.	46862.

0.5 PMF

MAXIMUM STORAGE = 142.

HYDROGRAPH ROUTING

ROUTE FROM SECTION 1.0 TO SECTION 4.0 (U.B. DAM SECT) + 2400FT DS U.B. DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
708	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

STORAGE	0.00	30.10	44.10	65.70	116.40	136.60	180.00	221.40	263.80
	354.40	402.50	453.50	505.60	616.80	673.80	732.10		
OUTFLOW	0.00	280.00	1450.00	3140.00	5300.00	5920.00	7380.00	9740.00	12790.00
	20610.00	25200.00	30350.00	35740.00	40170.00	55170.00	62510.00		

FLOWS @ 2400 FT DS FROM UPPER BRIDGEPORT DAM (SECTION 8 ⇒ LOWER BRIDGEPORT DAM SECTION)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	39969.	34689.	17422.	6380.	1837360.
CMS	1132.	982.	493.	181.	52028.
INCHES		10.24	20.58	22.61	22.61
MM		260.20	522.74	574.25	574.25
AC-FT		17201.	34557.	37962.	37962.
THOUS CU M		21217.	42625.	46825.	46825.

PMF

MAXIMUM STORAGE = 543.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7084.	6351.	3312.	1224.	352520.
CMS	201.	180.	94.	35.	9982.
INCHES		1.88	3.91	4.34	4.34
MM		47.64	99.37	110.18	110.18
AC-FT		3149.	6569.	7283.	7283.
THOUS CU M		3884.	8103.	8984.	8984.

0.2 PMF

MAXIMUM STORAGE = 171.

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	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	19633.	17055.	8601.	3155.	908731.
CMS	556.	483.	244.	89.	25732.
INCHES		5.04	10.16	11.18	11.18
MM		127.93	258.05	284.01	284.01
AC-FT		8457.	17059.	18775.	18775.
THOUS CU M		10431.	21042.	23159.	23159.

MAXIMUM STORAGE = 344.

SUMMARY OF DAM SAFETY ANALYSIS

PA-657 DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1827.50	1835.00	1844.40
STORAGE	93.	460.	1540.
OUTFLOW	0.	0.	10182.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1834.35	0.00	417.	0.	0.00	0.00	0.00
.20	1835.85	0.00	534.	493.	0.00	44.75	0.00
.30	1836.78	0.00	616.	1036.	0.00	43.75	0.00
.50	1838.35	0.00	758.	2029.	0.00	43.00	0.00
1.00	1840.46	0.00	1012.	4413.	0.00	42.75	0.00

ROUTING SECTIONS BETWEEN PA-657 AND UPPER BRIDGEPORT DAMS

PLAN 1 STATION 1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	0.	1796.0	.25
.20	493.	1799.3	44.75
.30	1036.	1800.8	43.75
.50	2030.	1802.4	43.25
1.00	4409.	1804.4	42.75

PLAN 1 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	0.	1280.0	.25
.20	478.	1282.7	45.75
.30	1006.	1284.3	44.50
.50	1977.	1285.8	44.00
1.00	4309.	1288.4	43.50

PLAN 1 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	0.	1760.0	.25
.20	485.	1764.4	45.25
.30	1019.	1765.8	44.25
.50	1999.	1767.5	43.50
1.00	4369.	1770.0	44.25

PLAN 1 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	0.	1060.0	.25
.20	460.	1063.0	46.50
.30	954.	1064.4	45.50
.50	1858.	1065.6	45.00
1.00	4100.	1067.4	44.50

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 78-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. R OF 82

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SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 78-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. 5 OF 13

SUMMARY OF DAM SAFETY ANALYSIS
UPPER BRIDGEPORT DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1053.50	1053.50	1059.00
STORAGE	530.	530.	1250.
OUTFLOW	0.	0.	7130.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1057.52	0.00	1007.	3426.	0.00	44.25	0.00
.20	1059.00	0.00	1250.	7128.	0.00	44.00	0.00
.30	1060.12	1.12	1464.	11403.	6.75	44.00	0.00
.50	1061.48	2.48	1761.	19653.	11.50	43.75	0.00
1.00	1064.00	5.00	2391.	39957.	17.75	43.75	0.00

STATION 607

≈ 550 FT DS FROM UPPER BRIDGEPORT DAM @ 1ST STRUCTURE

RATIO	MAXIMUM FLOW, CFS	MAXIMUM* STAGE, FT
0.1	3422	1048.9
0.2	7125	1052.5
0.3	11407	1054.3
0.5	19657	1056.6
1.0	39968	1060.5

(SECTION 7)

STATION 708

≈ 2400 FT DS FROM UPPER BRIDGEPORT DAM @ LOWER BRIDGEPORT DAM

RATIO	MAXIMUM FLOW, CFS	MAXIMUM* STAGE, FT
0.1	3405	1047.7
0.2	7084	1050.8
0.3	11378	1052.5
0.5	19633	1054.8
1.0	39964	1058.7

(SECTION 8)

* FROM SHEETS B AND C

DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM W/ US PA-657 DAM + DS LOWER BRIDGEPORT DAM *BREACHING*
15-MINUTE TIME STEP AND 48-HOUR STORM DURATION

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	15	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 5 NRTIO= 1 LRTIO= 1

RTIOS= .22

HYDROGRAPH ROUTING

ROUTE COMBINED HYDROGRAPH THROUGH UPPER BRIDGEPORT RESERVOIR

PLAN

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1059.0	0.0	0.0	0.

① DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
10.	.50	1052.00	.75	1053.50	1059.00

STATION 606, PLAN 1, RATIO 1

BEGIN DAM FAILURE AT 42.75 HOURS

PEAK OUTFLOW IS 6320. AT TIME 43.50 HOURS

② DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
460.	4.00	1052.00	.75	1053.50	1059.00

STATION 606, PLAN 2, RATIO 1

BEGIN DAM FAILURE AT 42.75 HOURS

PEAK OUTFLOW IS 18540. AT TIME 43.50 HOURS

③ DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
10.	.50	1052.00	4.00	1053.50	1059.00

STATION 606, PLAN 3, RATIO 1

BEGIN DAM FAILURE AT 42.75 HOURS

PEAK OUTFLOW IS 6023. AT TIME 44.17 HOURS

BREACHING OF UPPER BRIDGEPORT DAM ONLY, SINCE THE PA-657 DAM WILL NOT BE OVERTOPPED BY THE PMF. (SAME INPUT DATA AS FOR THE OVERTOPPING ANALYSIS W/ THE ADDITION OF THE BREACH DATA GIVEN HERE)

BREACHING ANALYSIS

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 78-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. 7 OF 23

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 78-617-463
CHKD. BY DLB DATE 7-2-79 SHEET NO. 5 OF 88

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DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
460.	4.00	1052.00	4.00	1053.50	1059.00

STATION 606, PLAN 4, RATIO 1

(4)

BEGIN DAM FAILURE AT 42.75 HOURS

PEAK OUTFLOW IS 9837. AT TIME 44.50 HOURS

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
200.	2.00	1052.00	1.50	1053.50	1059.00

(5)

STATION 606, PLAN 5, RATIO 1

BEGIN DAM FAILURE AT 42.75 HOURS

PEAK OUTFLOW IS 11690. AT TIME 44.25 HOURS

THE DAM BREACH HYDROGRAPH WAS DEVELOPED USING A TIME INTERVAL OF .031 HOURS DURING BREACH FORMATION.
DOWNSTREAM CALCULATIONS ALSO USE A TIME INTERVAL OF .250 HOURS.
THIS TABLE COMPARES THE HYDROGRAPH FOR DOWNSTREAM CALCULATIONS WITH THE COMPUTED BREACH HYDROGRAPH.
INTERMEDIATE FLOWS ARE INTERPOLATED FROM END-OF-PERIOD VALUES.

(5)

TIME (HOURS)	TIME FROM BEGINNING OF BREACH (HOURS)	INTERPOLATED BREACH HYDROGRAPH (CFS)	- COMPUTED BREACH HYDROGRAPH (CFS)	= ERROR (CFS)	ACCUMULATED ERROR (CFS)	ACCUMULATED ERROR (AC-FT)
42.750	0.000	7133.	7133.	0.	0.	0.
42.781	.031	7261.	7212.	49.	49.	0.
42.813	.063	7390.	7319.	71.	120.	0.
42.844	.094	7519.	7442.	77.	197.	1.
42.875	.125	7648.	7575.	72.	269.	1.
42.906	.156	7777.	7716.	60.	330.	1.
42.938	.188	7905.	7862.	43.	373.	1.
42.969	.219	8034.	8011.	23.	396.	1.
43.000	.250	8163.	8163.	0.	396.	1.
43.031	.281	8311.	8316.	-5.	391.	1.
43.063	.313	8459.	8468.	-9.	382.	1.
43.094	.344	8607.	8619.	-13.	370.	1.
43.125	.375	8755.	8769.	-15.	355.	1.
43.156	.406	8902.	8917.	-15.	341.	1.
43.188	.438	9050.	9063.	-12.	328.	1.
43.219	.469	9198.	9206.	-7.	321.	1.
43.250	.500	9346.	9346.	-0.	321.	1.
43.281	.531	9471.	9484.	-14.	307.	1.

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

BY WJV DATE 6-27-79 PROJ. NO. 79-617-465

CHKD. BY DLB DATE 7-2-79 SHEET NO. V OF BB

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TIME (HOURS)	TIME FROM BEGINNING OF BREACH (HOURS)	INTERPOLATED BREACH HYDROGRAPH (CFS)	-	COMPUTED BREACH HYDROGRAPH (CFS)	=	ERROR (CFS)	ACCUMULATED ERROR (CFS)	ACCUMULATED ERROR (AC-FT)
43.313	.563	9595.		9619.		-23.	284.	1.
43.344	.594	9720.		9749.		-29.	255.	1.
43.375	.625	9845.		9876.		-31.	223.	1.
43.406	.656	9969.		9999.		-30.	194.	0.
43.438	.688	10094.		10117.		-24.	170.	0.
43.469	.719	10218.		10232.		-14.	156.	0.
43.500	.750	10343.		10343.		0.	156.	0.
43.531	.781	10437.		10450.		-13.	143.	0.
43.563	.813	10530.		10552.		-22.	121.	0.
43.594	.844	10624.		10651.		-27.	94.	0.
43.625	.875	10718.		10745.		-28.	67.	0.
43.656	.906	10811.		10836.		-25.	42.	0.
43.688	.938	10905.		10923.		-18.	25.	0.
43.719	.969	10999.		11006.		-7.	17.	0.
43.750	1.000	11092.		11092.		0.	17.	0.
43.781	1.031	11167.		11180.		-13.	4.	0.
43.813	1.063	11242.		11265.		-22.	-18.	-0.
43.844	1.094	11318.		11345.		-27.	-45.	-0.
43.875	1.125	11393.		11421.		-29.	-74.	-0.
43.906	1.156	11468.		11494.		-27.	-101.	-0.
43.938	1.188	11543.		11564.		-21.	-122.	-0.
43.969	1.219	11618.		11630.		-12.	-134.	-0.
44.000	1.250	11693.		11693.		0.	-134.	-0.
44.031	1.281	11718.		11753.		-35.	-169.	-0.
44.063	1.313	11742.		11781.		-39.	-208.	-1.
44.094	1.344	11767.		11802.		-35.	-243.	-1.
44.125	1.375	11792.		11822.		-30.	-273.	-1.
44.156	1.406	11816.		11840.		-24.	-297.	-1.
44.188	1.438	11841.		11857.		-16.	-313.	-1.
44.219	1.469	11866.		11873.		-8.	-321.	-1.
44.250	1.500	11890.		11890.		0.	-321.	-1.

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

BY WJV DATE 6-27-79 PROJ. NO. 78-617-465

CHKD. BY DLB DATE 7-2-79 SHEET NO. W OF BB

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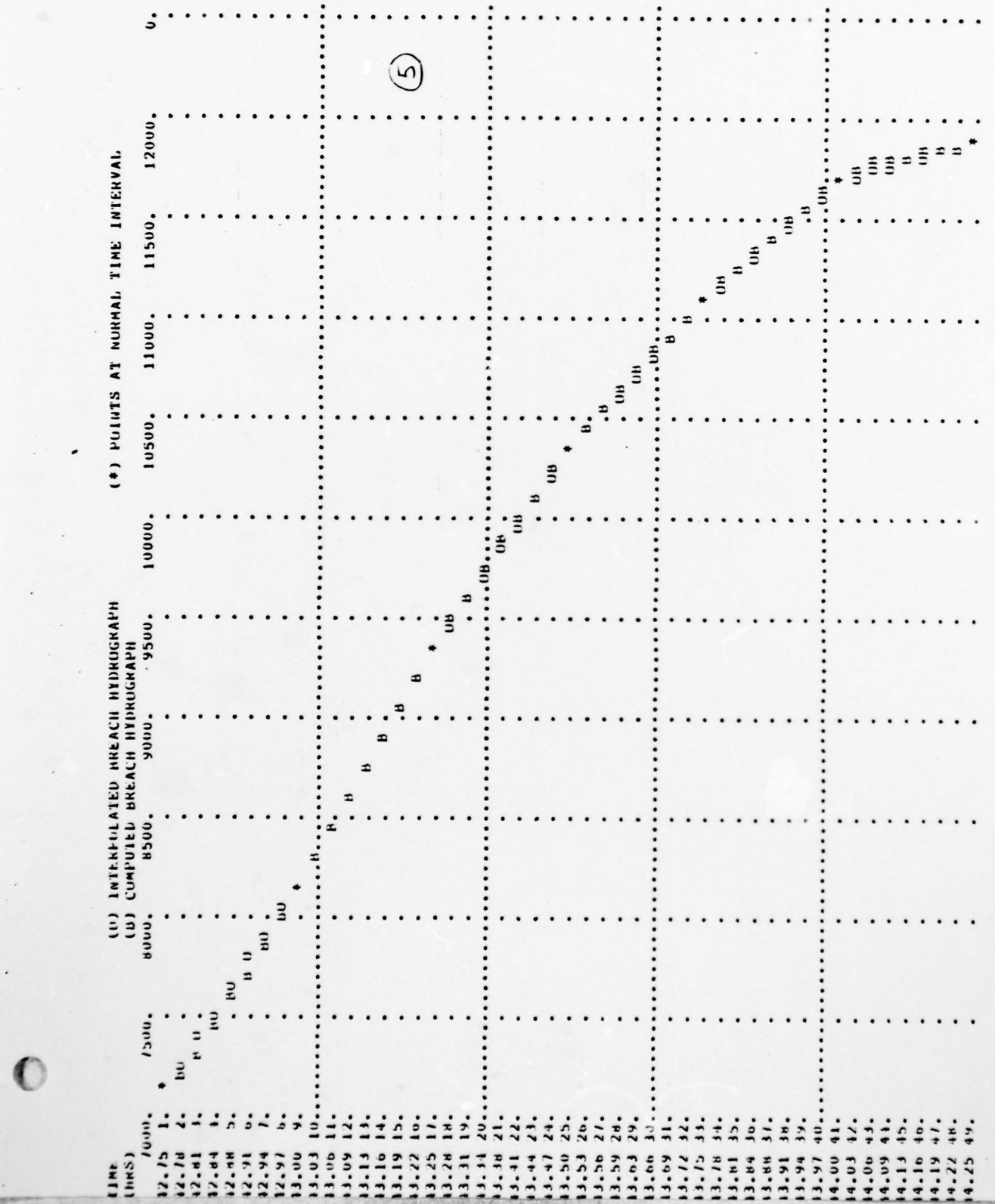
(5)



SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 78-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. X OF 88

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PLAN

DAM BREACH DATA

BRWID	Z	ELBM	TRAIL	WSEL	FAILEL
200.	2.00	1052.00	1.50	1053.50	1059.00

NOTE: UNDER ½ PMF BASE CONDITIONS

(6) BEGIN DAM FAILURE AT 40.25 HOURS

PEAK OUTFLOW IS 19673. AT TIME 43.50 HOURS

THE DAM BREACH HYDROGRAPH WAS DEVELOPED USING A TIME INTERVAL OF .031 HOURS DURING BREACH FORMATION.
DOWNSTREAM CALCULATIONS WILL USE A TIME INTERVAL OF .250 HOURS.
THIS TABLE COMPARES THE HYDROGRAPH FOR DOWNSTREAM CALCULATIONS WITH THE COMPUTED BREACH HYDROGRAPH.
INTERMEDIATE FLOWS ARE INTERPOLATED FROM END-OF-PERIOD VALUES.

TIME (HOURS)	TIME FROM BEGINNING OF BREACH (HOURS)	INTERPOLATED BREACH HYDROGRAPH (CFS)	-	COMPUTED BREACH HYDROGRAPH (CFS)	=	ERROR (CFS)	ACCUMULATED ERROR (CFS)	ACCUMULATED ERROR (AC-FT)
40.250	0.000	7573.		7573.		0.	0.	0.
40.281	.031	7797.		7744.		53.	53.	0.
40.313	.063	8020.		7939.		81.	134.	0.
40.344	.094	8244.		8152.		92.	226.	1.
40.375	.125	8468.		8378.		90.	316.	1.
40.406	.156	8692.		8614.		78.	394.	1.
40.438	.188	8915.		8858.		58.	452.	1.
40.469	.219	9139.		9108.		31.	484.	1.
40.500	.250	9363.		9363.		-0.	484.	1.
40.531	.281	9628.		9622.		6.	490.	1.
40.563	.313	9893.		9885.		9.	498.	1.
40.594	.344	10158.		10149.		9.	507.	1.
40.625	.375	10423.		10415.		8.	516.	1.
40.656	.406	10688.		10682.		6.	522.	1.
40.688	.438	10954.		10950.		4.	525.	1.
40.719	.469	11219.		11217.		2.	527.	1.
40.750	.500	11484.		11484.		0.	527.	1.
40.781	.531	11745.		11750.		-4.	523.	1.
40.813	.563	12007.		12015.		-8.	515.	1.
40.844	.594	12269.		12279.		-10.	505.	1.
40.875	.625	12531.		12542.		-12.	493.	1.
40.906	.656	12792.		12804.		-11.	482.	1.
40.938	.688	13054.		13064.		-9.	472.	1.

(6) ½ PMF CONDITIONS

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

BY WJY DATE 6-27-79 PROJ. NO. 78-617-465

CHKD. BY DLB DATE 7-2-79 SHEET NO. Y OF BB

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(6)

1/2 PMF
CONDITIONS

TIME (HOURS)	TIME FROM BEGINNING OF BREACH (HOURS)	INTERPOLATED BREACH HYDROGRAPH (CFS)	-	COMPUTED BREACH HYDROGRAPH (CFS)	=	ERROR (CFS)	ACCUMULATED ERROR (CFS)	ACCUMULATED ERROR (AC-FT)
40.969	.719	13316.		13322.		-6.	467.	1.
41.000	.750	13578.		13578.		0.	467.	1.
41.031	.781	13825.		13832.		-7.	459.	1.
41.063	.813	14072.		14084.		-12.	447.	1.
41.094	.844	14319.		14334.		-15.	432.	1.
41.125	.875	14566.		14582.		-17.	415.	1.
41.156	.906	14813.		14828.		-16.	399.	1.
41.188	.938	15060.		15072.		-13.	387.	1.
41.219	.969	15307.		15314.		-7.	380.	1.
41.250	1.000	15554.		15554.		0.	380.	1.
41.281	1.031	15783.		15791.		-8.	371.	1.
41.313	1.063	16012.		16026.		-14.	358.	1.
41.344	1.094	16242.		16259.		-17.	340.	1.
41.375	1.125	16471.		16489.		-18.	322.	1.
41.406	1.156	16700.		16717.		-17.	305.	1.
41.438	1.168	16929.		16943.		-14.	291.	1.
41.469	1.219	17158.		17166.		-8.	283.	1.
41.500	1.250	17388.		17388.		0.	283.	1.
41.531	1.281	17597.		17607.		-9.	274.	1.
41.563	1.313	17807.		17823.		-16.	259.	1.
41.594	1.344	18017.		18036.		-19.	239.	1.
41.625	1.375	18226.		18247.		-20.	219.	1.
41.656	1.406	18436.		18455.		-19.	200.	1.
41.688	1.438	18645.		18661.		-15.	185.	0.
41.719	1.469	18855.		18864.		-9.	176.	0.
41.750	1.500	19065		19065		0	176.	0.

AD-A078 912 GAI CONSULTANTS INC MONROEVILLE PA F/G 13/2
NATIONAL DAM INSPECTION PROGRAM UPPER BRIDGEPORT DAM NDI I.D. N--ETC(U)
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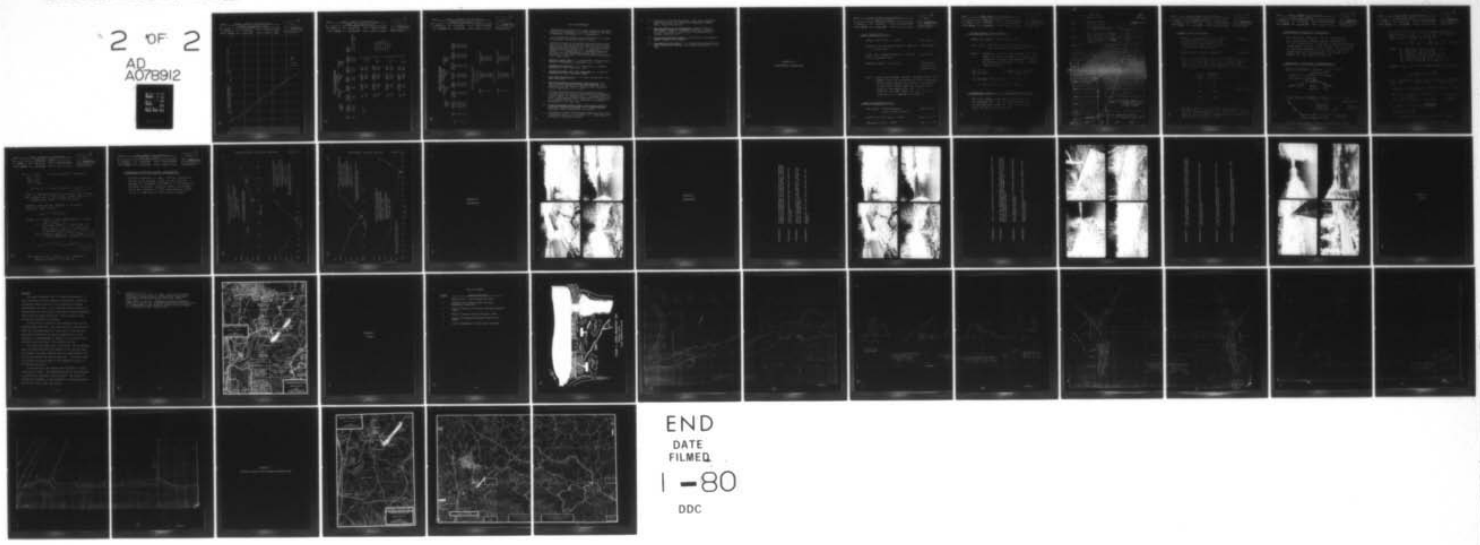

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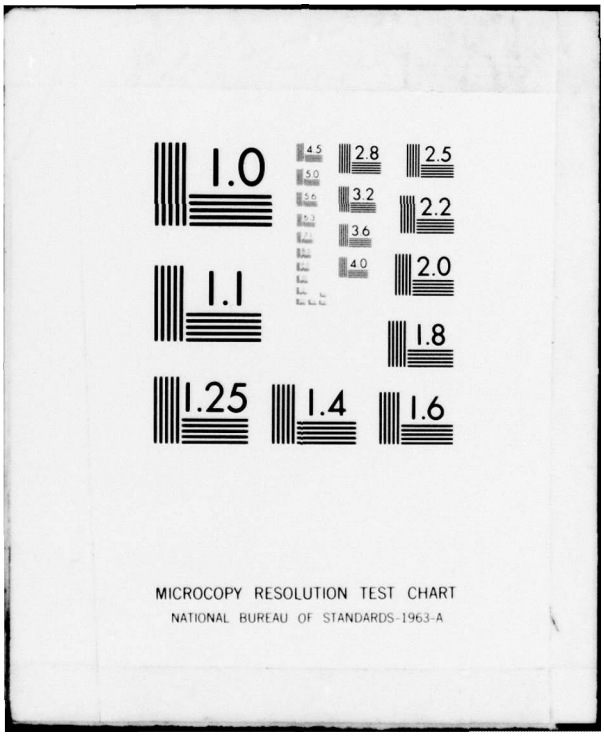
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SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM

BY WJV DATE 6-27-79 PROJ. NO. 78-617-4-65

CHKD. BY DLB DATE 7-2-79 SHEET NO. 7 OF BB

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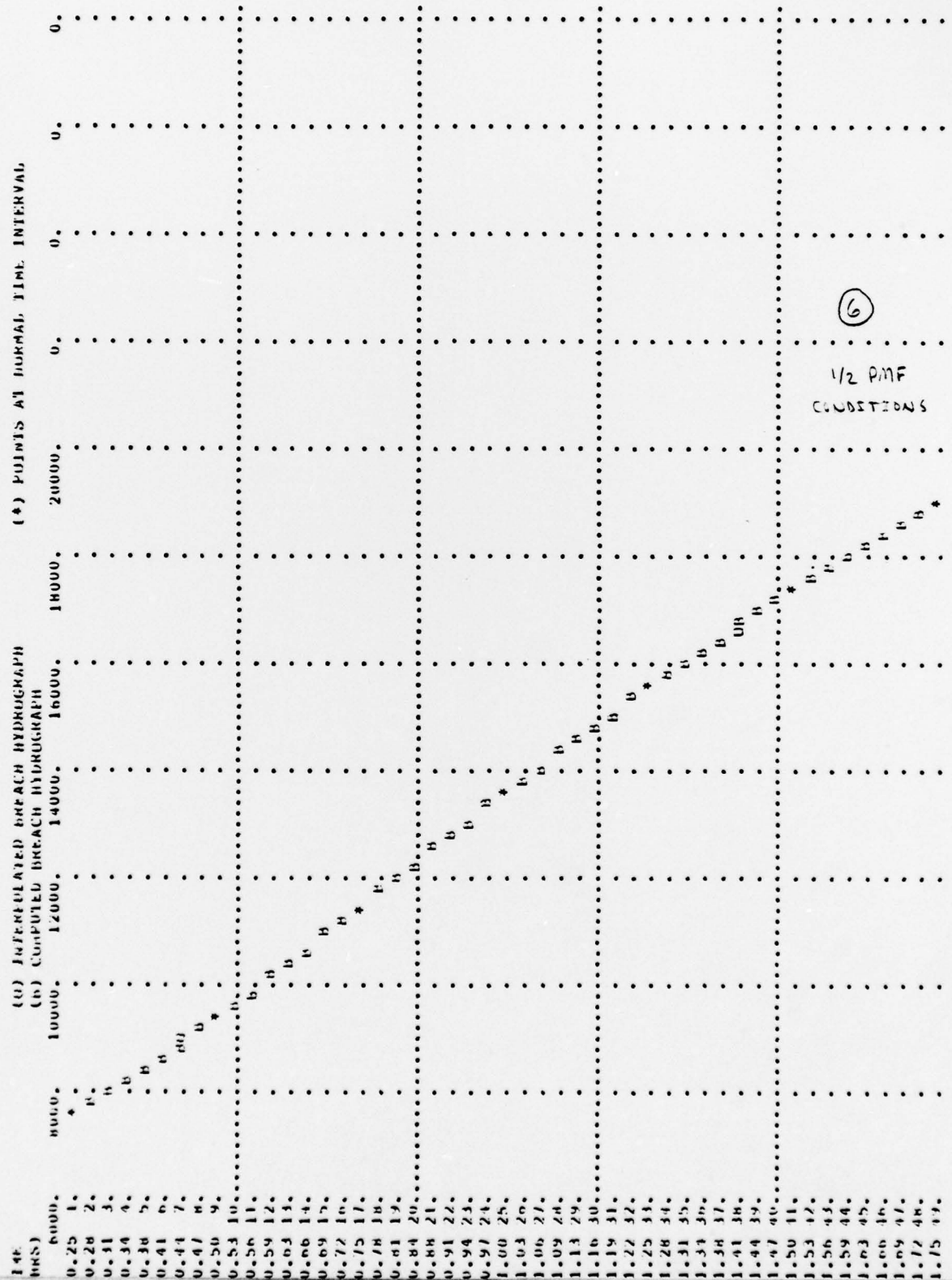
(6)

1/2 PMF CONDITIONS



SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79 PROJ. NO. 79-617-465
CHKD. BY DLB DATE 7-2-79 SHEET NO. AA OF 88

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SUMMARY OF DAM SAFETY ANALYSIS

PA-657 DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1827.50	1835.00	1844.40
STORAGE	93.	460.	1540.
OUTFLOW	0.	0.	10182.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS	
.22	1836.04	0.00	551.	605.	0.00	44.50	0.00	← PLANS ① → ⑤
.50	1838.35	0.00	758.	2029.	0.00	43.00	0.00	← PLAN ⑥

SECTION	RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS	
2	.22	605.	1799.8	44.50	① → ⑤
	.50	2030.	1802.4	43.25	⑥
3	.22	595.	1764.7	45.00	① → ⑤
	.50	1999.	1767.5	43.50	⑥
4	.22	587.	1283.1	45.25	① → ⑤
	.50	1977.	1285.8	44.00	⑥
5	.22	566.	1063.4	46.00	① → ⑤
	.50	1858.	1065.6	45.00	⑥

ROUTING SECTIONS BETWEEN PA-657 DAM AND UPPER BRIDGEPORT DAM

SUBJECT DAM SAFETY INSPECTION
UPPER BRIDGEPORT DAM
BY WJV DATE 6-27-79
CHKD. BY DLB DATE 7-2-79
PROJ. NO. 78-617-465
SHEET NO. 88 OF 88

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SUMMARY OF DAM SAFETY ANALYSIS

UPPER BRIDGEPORT DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1053.50	1053.50	1059.00
STORAGE	530.	530.	1250.
OUTFLOW	0.	0.	7130.

PLAN	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1	.22	1059.14	.14	1277.	8326.	2.25	43.50	42.75
2	.22	1059.02	.02	1254.	18546.	.40	43.50	42.75
3	.22	1059.23	.23	1295.	8023.	3.00	44.17	42.75
4	.22	1059.08	.08	1265.	9837.	.92	44.50	42.75
5	.22	1059.06	.06	1261.	11890.	.72	44.25	42.75
6	.50	1059.46	.46	1338.	19693.	3.22	43.50	40.25

DOWNSTREAM CHANNEL ROUTING

SECTION 7

PLAN	FLOW (CFS) *	ELEVATION (FT) **
1	8316	1053.1
2	18227	1056.2
3	8023	1053.1
4	9836	1053.8
5	11891	1054.5
6	19692	1056.6

SECTION 8

PLAN	FLOW (CFS) *	ELEVATION (FT) **
1	8229	1051.4
2	16454	1054.0
3	8006	1051.3
4	9794	1052.0
5	11652	1052.6
6	19686	1054.8

* FLOWS FROM DETAILED HEC-1 OUTPUT

** FROM SHEETS B AND C

LIST OF REFERENCES

1. "Recommended Guidelines for Safety Inspection of Dams," prepared by Department of the Army Office of the Chief of Engineers, Washington, D. C. (Appendix D).

2. "Unit Hydrograph Concepts and Calculations," by Corps of Engineers, Baltimore District (L-519).

3. "Seasonal Variation of Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1,000 Square Miles and Duration of 6, 12, 24, and 48 Hours," Hydrometeorological Report No. 33, prepared by J. T. Riedel, J. F. Appleby and R. W. Schloemer Hydrologic Service Division Hydrometeorological Section, U. S. Department of the Army, Corps of Engineers, Washington, D. C., April 1956.

4. Design of Small Dams, U. S. Department of the Interior, Bureau of Reclamation, Washington, D. C., 1973.

5. Handbook of Hydraulic, H. W. King and E. F. Brater, McGraw-Hill, Inc., New York, 1963.

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7. Open-Channel Hydraulics, V. T. Chow, McGraw-Hill, Inc., New York, 1959.

8. Weir Experiments, Coefficients, and Formulas, R. E. Horton, Water Supply and Irrigation Paper No. 200, Department of the Interior, United States Geological Survey, Washington, D. C., 1907.

9. "Probable Maximum Precipitation Susquehanna River Drainage Above Harrisburg, Pennsylvania," Hydrometeorological Report 40, prepared by H. V. Goodyear and J. T. Riedel, Hydrometeorological Branch Office of Hydrology, U. S. Weather Bureau, U. S. Department of Commerce, Washington, D. C., May 1965.

10. Flood Hydrograph Package (HEC-1) Dam Safety Version, Hydrologic Engineering Center, U. S. Army Corps of Engineers, Davis, California, July 1978.

11. "Simulation of Flow Through Broad Crest Navigation Dams with Radial Gates," R. W. Schmitt, U. S. Army Corps of Engineers, Pittsburgh District.

12. "Hydraulics of Bridge Waterways," BPR, 1970, Discharge Coefficient Based on Criteria for Embankment Shaped Weirs, Figure 24, page 46.

13. Applied Hydraulics in Engineering, Morris, Henry M. and Wiggert, James N., Virginia Polytechnic Institute and State University, 2nd Edition, The Ronald Press Company, New York, 1972.

14. Standard Mathematical Tables, 21st Edition, The Chemical Rubber Company, 1973, page 15.

15. Engineering Field Manual, U. S. Department of Agriculture, Soil Conservation Service, 2nd Edition, Washington, D. C. 1969.

APPENDIX C-1

SUPPLEMENTAL CALCULATIONS

SUBJECT DAM SAFETY INSPECTION
PA-657 DAM

BY WJV DATE 5-16-79 PROJ. NO. 78-617-929

CHKD. BY DLB DATE 6-2-79 SHEET NO. 1 OF 10

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DAM STATISTICS

HEIGHT OF DAM ≈ 33 FT (FIELD MEASURED)

MAXIMUM POOL STORAGE CAPACITY ≈ 1540 AC-FT (SEE SHEET 3)
@ TOP OF DAM

NORMAL POOL STORAGE CAPACITY ≈ 93 AC-FT (SEE NOTE 1)
@ TOP OF RECREATION POOL

DRAINAGE AREA ≈ 2.6 SQ. MI.

[PLANIMETERED OFF USGS 7.5 MINUTE DONEGAL, PA QUAD]

NOTE 1: NORMAL POOL STORAGE CAPACITY OBTAINED FROM THE "REPORT UPON THE APPLICATION OF THE COMMISSIONERS OF WESTMORELAND COUNTY [TO CONSTRUCT AND MAINTAIN A DAM ACROSS JACOB'S CREEK IN MOUNT PLEASANT TOWNSHIP, WESTMORELAND COUNTY]" (1972), AS FOUND IN PENN DER FILES; AND ALSO FROM DEPTH INFORMATION AS PRESENTED ON SHEET 3

DAM CLASSIFICATION

DAM SIZE - INTERMEDIATE (REF 1, TABLE 1)
(DUE TO STORAGE CAPACITY)

HAZARD CLASSIFICATION - HIGH (FIELD OBSERVATION)

REQUIRED SDF - PMF (REF 1, TABLE 3)

SUBJECT DAM SAFETY INSPECTION
PA-657 DAM

BY WJV DATE 5-21-79 PROJ. NO. 78-617-829

CHKD. BY DLB DATE 6-2-79 SHEET NO. 2 OF 10

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HYDROGRAPH PARAMETERS

LENGTH OF LONGEST WATERCOURSE ≈ 3.0 MI

L_{CA} ≈ 1.4 MI (MEASURED ALONG THE LONGEST WATERCOURSE FROM THE DAM CREST TO THE CENTROID OF THE BASIN)

NOTE 2: VALUES OF L AND LCA ARE MEASURED FROM THE USGS 7.5 MINUTE DONEGAL, PA QUAD. ALL HYDROGRAPH VARIABLES ARE DEFINED IN REF. 2 IN THE SECTION ENTITLED "SNYDER SYNTHETIC UNIT HYDROGRAPH".

$C_t \approx 1.0$
$C_p \approx 0.40$

[SUPPLIED BY COE; ZONE 25 OHIO RIVER BASIN]

t_p = SNYDER'S STANDARD LAG ≈ $1.0 (L \times L_{CA})^{0.3}$

$\therefore \quad t_p = 1.0 (3.0 \times 1.4)^{0.3} \approx 1.54$ HRS

RESERVOIR ELEVATION - STORAGE RELATIONSHIP

THE ACTUAL DESIGN RELATIONSHIP FOR THE DAM WAS OBTAINED FROM THE SCS DESIGN FILES AND IS PROVIDED ON SHEET 3. THIS RELATIONSHIP WILL BE USED IN THE ANALYSIS.

PA-657

Jacobs Creek

WJC

Feb 16, 1966

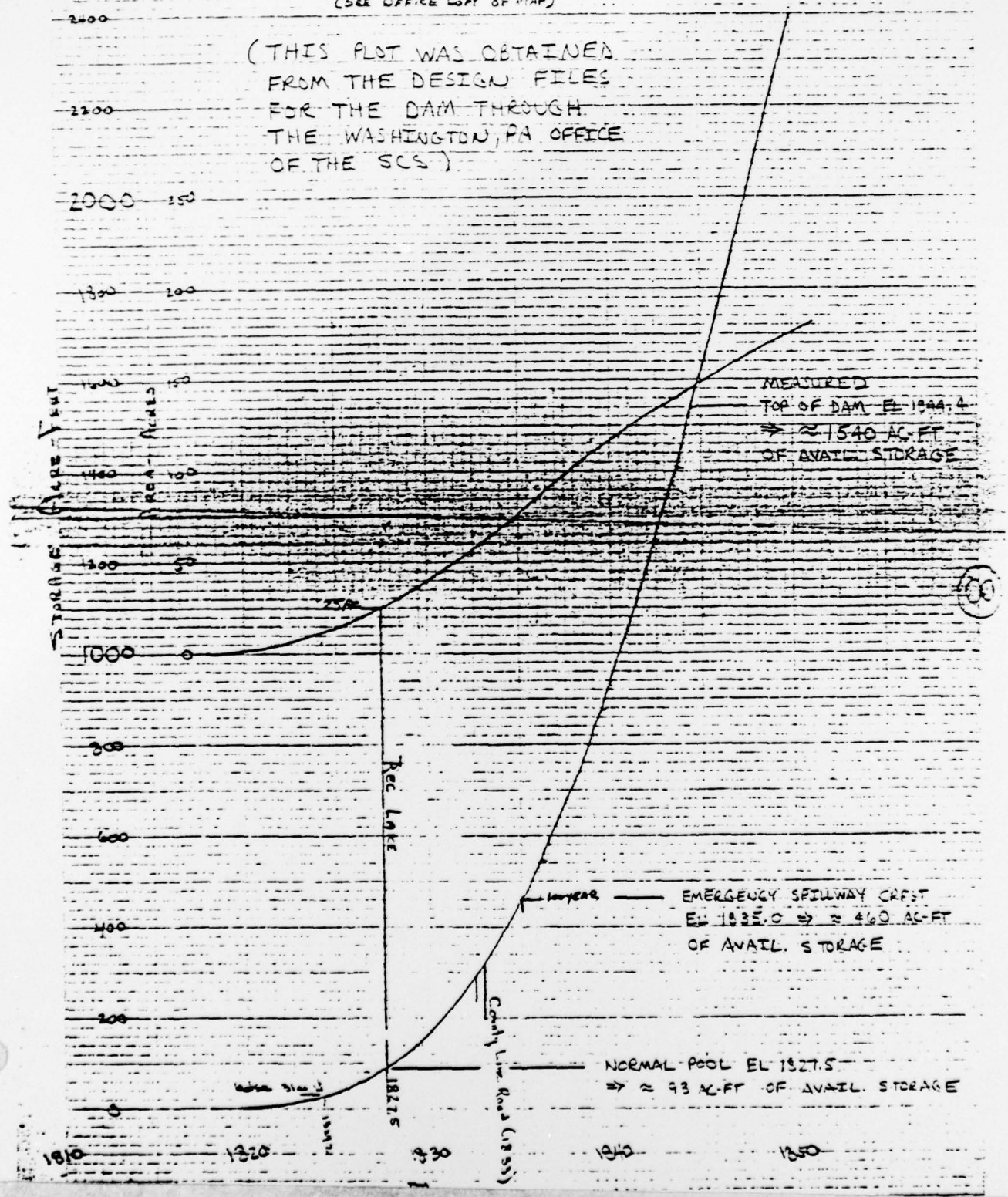
Stage vs Storage

SHEET 3 OF 10

EA - DAM IN PLACE

NOTE - CHANGE TO EB INSIGNIFICANT LOG 3/15/66
(SEE OFFICE COPY OF MAP)

(THIS PLOT WAS OBTAINED FROM THE DESIGN FILES FOR THE DAM THROUGH THE WASHINGTON, PA OFFICE OF THE SCS)



SUBJECT DAM SAFETY INSPECTION
PA-657 DAM

BY WJV DATE 5-21-79 PROJ. NO. 79-617-929

CHKD. BY DLB DATE 6-7-79 SHEET NO. 4 OF 10

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PMP CALCULATIONS

- APPROXIMATE RAINFALL INDEX = 24 IN (REF 3, FIG 1)
  (CORRESPONDING TO A DURATION OF 24 HOURS AND AN AREA OF 200 SQ.MI. IN SOUTHWESTERN PENNSYLVANIA)

- DEPTH - AREA - DURATION ZONE #7 (REF 3, FIG 1)

- LOCAL DRAINAGE AREA ≈ 2.6 SQ MI. HOWEVER, THE STORM WILL BE CENTERED OVER THE TOTAL DRAINAGE AREA OF 31.5 SQ MI ABOVE THE UPPER BRIDGEPORT DAM ⇒ DEPTH - DURATION RELATIONSHIP BASED ON DA = 31.5 SQ MI. :

DURATION (HR)	PERCENT OF INDEX RAINFALL (%)
6	90
12	109
24	119
48	128

(REF 3, FIG 2)

- HOP BROOK FACTOR (ADJUSTMENT FOR BASIN SHAPE AS WELL AS FOR THE LESSER LIKELIHOOD OF A SEVERE STORM CENTERING OVER A SMALLER BASIN) CORRESPONDING TO A DA ≈ 31.5 SQ MI ⇒ 0.937 (AS COMPUTED BY HEC-1)

SUBJECT DAM SAFETY INSPECTION
PA-657 DAM

BY WJV DATE 5-21-79 PROJ. NO. 79-617-928

CHKD. BY DLB DATE 6-7-79 SHEET NO. 5 OF 10

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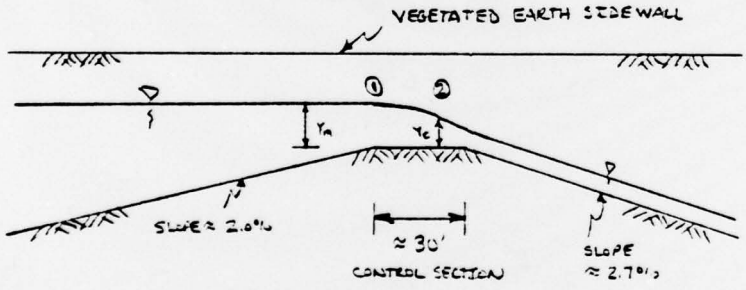
SPILLWAY CAPACITY (SERVICE)

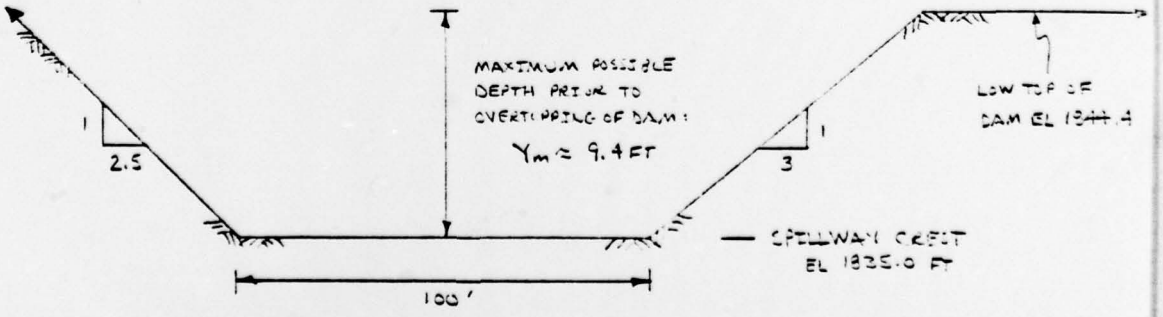
THE PRINCIPAL SPILLWAY IS A CONVENTIONAL SCS DROP-INLET, VERTICAL RISER STRUCTURE W/ A 30" OUTLET PIPE. ACCORDING TO DESIGN INFORMATION (OBTAINED FROM THE SCS), THE CAPACITY OF THE SERVICE OR PRINCIPAL SPILLWAY IS ONLY ABOUT 120CFS PRIOR TO OVERTOPPING OF THE EMBANKMENT ⇒ IGNORE THE EFFECTS OF THE SERVICE SPILLWAY.

SPILLWAY CAPACITY (EMERGENCY)

- PROFILE OF EMERGENCY SPILLWAY: (NOT TO SCALE)
(FROM DESIGN DRAWINGS, AND FIELD MEASUREMENT AND OBSERVATION)



- CROSS-SECTION OF EMERGENCY SPILLWAY: (NOT TO SCALE)
(FROM DESIGN DRAWINGS, AND FIELD MEASUREMENT AND OBSERVATION)



SECTION TAKEN LOOKING DOWNSTREAM @ EMERGENCY SPILLWAY

SUBJECT DAM SAFETY INSPECTION
PA-657 DAM

BY WJV DATE 5-21-79 PROJ. NO. 79-617-929

CHKD. BY DLB DATE 6-7-79 SHEET NO. 6 OF 10

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- ASSUME THAT THE WATER SURFACE PROFILE PASSES THROUGH CRITICAL DEPTH @ ② (AS SHOWN ON SKETCH ON SHEET 5): ENERGY BALANCE BETWEEN ① AND ② ⇒

$$Y_m + \cancel{v_1^2/2g}^{\,0} + Z_1 = Y_c + \frac{v_c^2}{2g} + Z_2 + \cancel{H_L}^{\,0} \qquad \text{(REF 7, PG 40)}$$

WHERE v_1 = RESERVOIR APPROACH VELOCITY ≈ 0
Z_1 = ELEVATION @ ① IN FT,
v_c = CRITICAL VELOCITY @ ② IN FPS,
Z_2 = ELEVATION @ ② IN FT, AND
H_L = HEAD LOSS BETWEEN ① AND ② ≈ 0 FT

SINCE $Z_1 - Z_2 \approx 0$ (BOTH LOCATED ON FLAT CONTROL SECTION)

$$\therefore \quad Y_m \approx 9.4 \text{ FT} \approx Y_c + v_c^2/2g$$

- FOR A TRAPEZOIDAL SHAPED CONTROL SECTION W/ CRITICAL DEPTH ⇒ $v_c^2/2g = A_c/2$ (REF 7, PG 42)

WHERE A_c = HYDRAULIC DEPTH = FLOW AREA/TOP WIDTH = A_c/W_c

$$A_c = 100\,Y_c + \tfrac{1}{2}(3Y_c \times Y_c) + \tfrac{1}{2}(2.5Y_c \times Y_c) = 100\,Y_c + 2.75\,Y_c^2$$
$$W_c = 100 + 3Y_c + 2.5\,Y_c = 100 + 5.5\,Y_c$$

} FROM GEOMETRY ON SHEET 5

- $\therefore \quad 9.4 = Y_c + A_c/2 = Y_c + \dfrac{100Y_c + 2.75Y_c^2}{2(100 + 5.5Y_c)}$

SOLVE FOR Y_c ⇒

$$9.4\,(200 + 11\,Y_c) = Y_c\,(200 + 11Y_c) + (100Y_c + 2.75\,Y_c^2)$$

$$0 = 13.75\,Y_c^2 + 196.6\,Y_c - 1880$$

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$\Rightarrow$ $Y_c \approx 6.6$ FT (VIA THE QUADRATIC EQUATION)

$A_c \approx 780 FT^2$

$v_c^2/2g \approx 2.9$ FT

$v_c \approx 13.4$ FPS

$\therefore Q = A_c v_c \approx (780 FT^2)(13.4 FPS) \approx 10450$ CFS (≈10180 CFS AS COMPUTED BY HEC-1 DUE TO COMPUTER ACCURACY)

- CHECK TO SEE IF CRITICAL FLOW ACTUALLY DOES CONTROL
  $\Rightarrow$ CHANNEL SLOPE DS FROM CONTROL SECTION SHOULD BY A SUPERCRITICAL SLOPE (> CRITICAL SLOPE)

CRITICAL SLOPE CAN BE DEFINED BY MANNING'S EQUATION (REF 13, PG 142):

$$S_c \approx \left(n v_c / 1.49 R_c^{2/3} \right)^2$$

WHERE S_c = CRITICAL SLOPE CORRESPONDING TO A FLOW WITH VELOCITY v_c,

n = ROUGHNESS FACTOR ≈ 0.032 BASED ON $v_c R_c$ PRODUCT ≈ 75.0 AND VEGETATIVE RETARDANCE CLASSIFICATION "C" (REF 15, PG 7-12

R_c = HYDRAULIC RADIUS = FLOW AREA / WETTED PERIMETER

$= 780 FT^2 / [100 + \sqrt{[3(60)]^2 + (60)^2} + \sqrt{[2.5(40)]^2 + (60)^2}] \approx 5.6$ FT

$$\therefore S_c \approx \left[(0.032)(13.4) / 1.49 (5.6)^{2/3} \right]^2 \approx 0.01 \text{ FT/FT} < 0.027 \text{ FT/FT (ACTUAL)}$$

$\Rightarrow$ CRITICAL FLOW CONTROLS AND EMERGENCY SPILLWAY CAPACITY ≈ 10450 CFS

SUBJECT DAM SAFETY INSPECTION
PA-657 DAM

BY WJV DATE 5-21-79 PROJ. NO. 79-617-829

CHKD. BY DLB DATE 6-2-79 SHEET NO. 8 OF 10

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SPILLWAY RATING CURVE (EMERGENCY)

COMPUTED INTERNALLY BY HEC-1 VIA THE TRAPEZOIDAL RATING CURVE ROUTINE, BASED ON THE SPILLWAY GEOMETRY AS PRESENTED ON SHEET 5. THE TRAPEZOIDAL ROUTINE CALCULATES CRITICAL CONTROL DISCHARGES IN A WAY SIMILAR TO THAT OUTLINED ON SHEETS 6 AND 7 (SEE SUMMARY INPUT/OUTPUT SHEETS)

SECTION A-A ≈ 2300 FT DS FROM PA-657

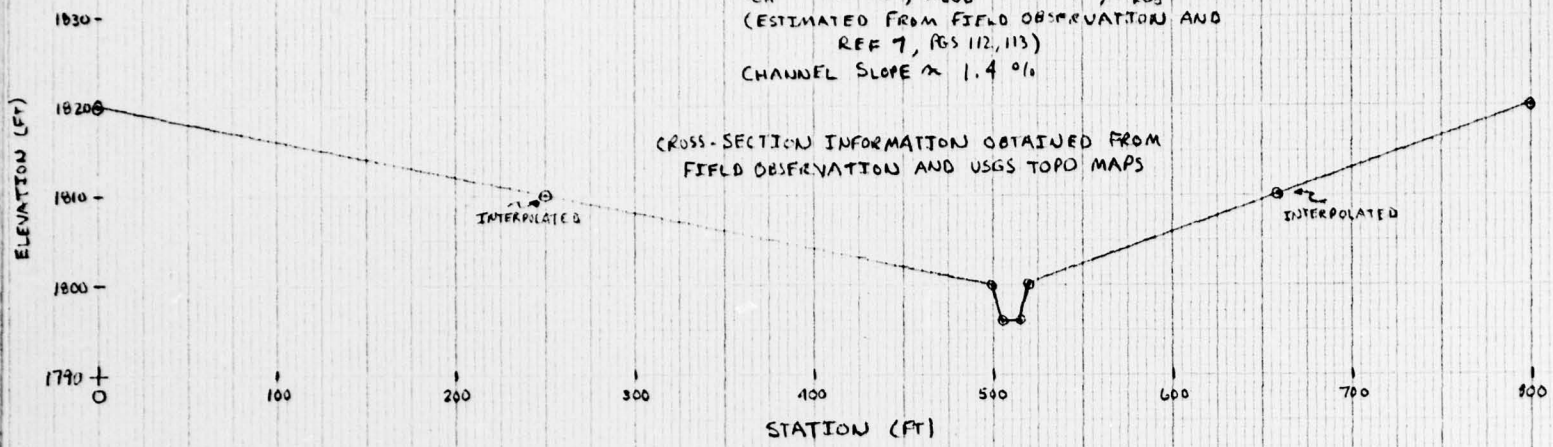
INVERT ELEVATION ≈ 1796 FT

$n_{CH} \approx 0.030$, $n_{LOB} \approx 0.09$, $n_{ROB} \approx 0.07$

(ESTIMATED FROM FIELD OBSERVATION AND REF 7, PGS 112, 113)

CHANNEL SLOPE ≈ 1.4 %

CROSS-SECTION INFORMATION OBTAINED FROM FIELD OBSERVATION AND USGS TOPO MAPS



SECTION B-B ≈ 5600 FT DS FROM SECTION A-A (≈ 7900 FT DS FROM PA-657)

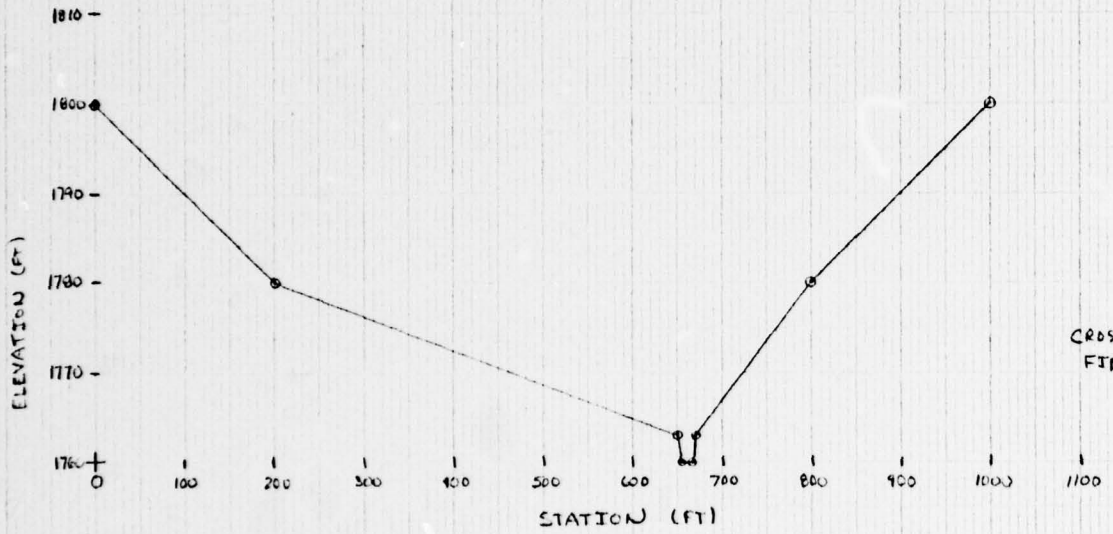
INVERT ELEVATION ≈ 1760 FT

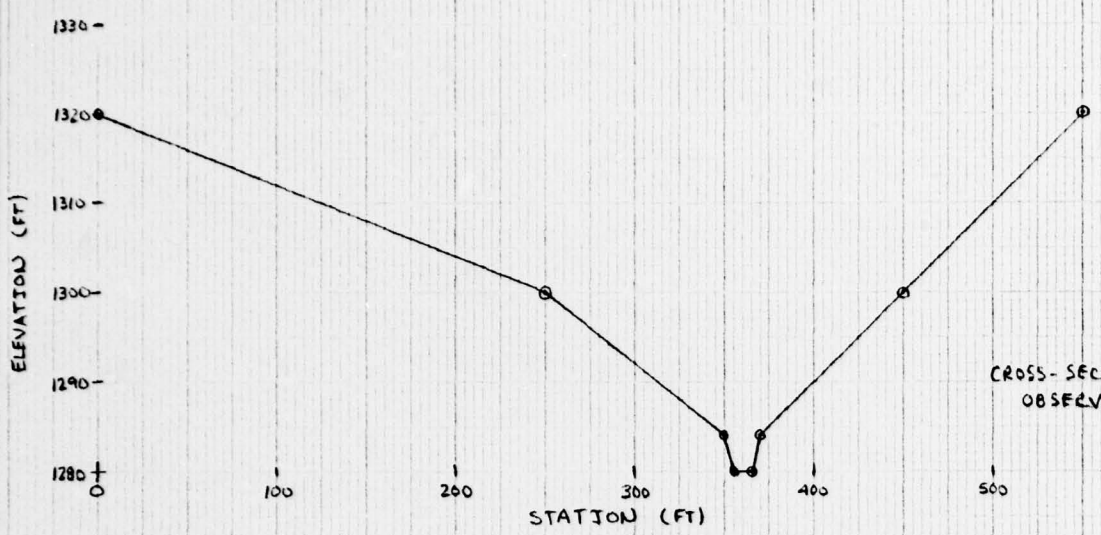
$n_{CH} \approx 0.030$, $n_{LOB} \approx 0.07$, $n_{ROB} \approx 0.08$

(ESTIMATED FROM FIELD OBSERVATION AND REF 7, PG 112, 113)

CHANNEL SLOPE ≈ 0.3 %

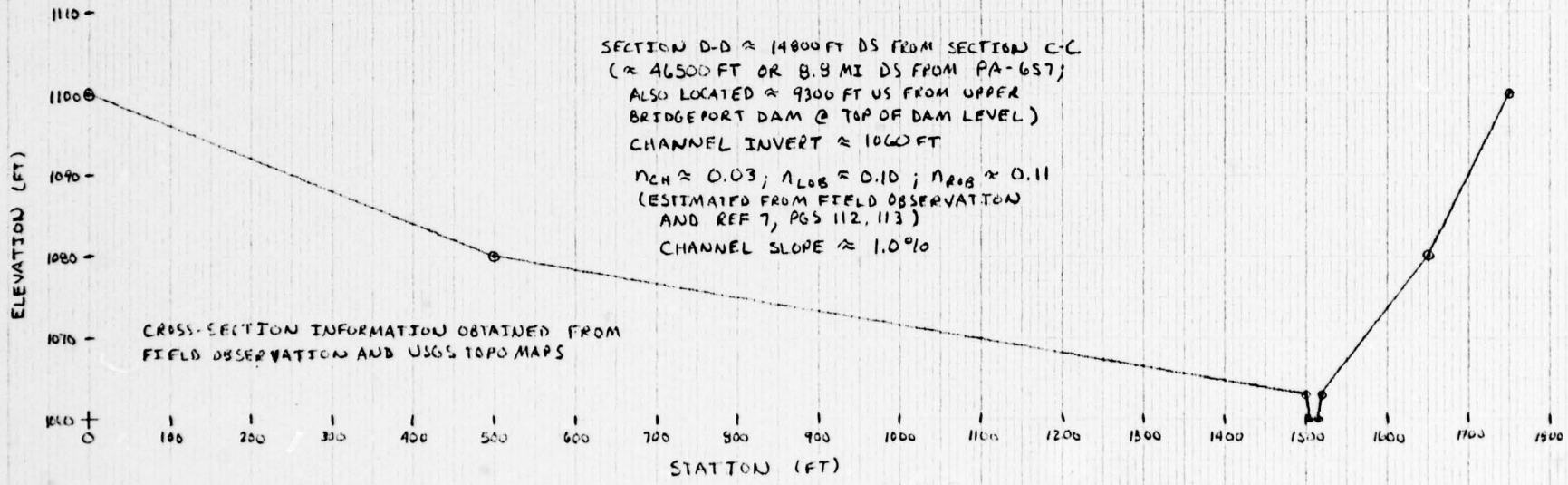
CROSS-SECTION INFORMATION OBTAINED FROM FIELD OBSERVATION AND USGS TOPO MAPS





SECTION C-C ≈ 23800 FT DS FROM SECT. B-B
(≈ 31700 FT DS FROM PA-657)
INVERT ELEVATION ≈ 1280 FT
$n_{CH} \approx 0.035$, $n_{LOB} \approx n_{ROB} \approx 0.12$
(ESTIMATED FROM FIELD OBSERVATION AND REF 7, PGS 112, 113)
CHANNEL SLOPE ≈ 3.1 %

CROSS-SECTION INFORMATION OBTAINED FROM FIELD OBSERVATION AND USGS TOPO MAPS



SECTION D-D ≈ 14800 FT DS FROM SECTION C-C
(≈ 46500 FT OR 8.8 MI DS FROM PA-657;
ALSO LOCATED ≈ 9300 FT US FROM UPPER BRIDGEPORT DAM @ TOP OF DAM LEVEL)
CHANNEL INVERT ≈ 1060 FT
$n_{CH} \approx 0.03$; $n_{LOB} \approx 0.10$; $n_{ROB} \approx 0.11$
(ESTIMATED FROM FIELD OBSERVATION AND REF 7, PGS 112, 113)
CHANNEL SLOPE ≈ 1.0 %

CROSS-SECTION INFORMATION OBTAINED FROM FIELD OBSERVATION AND USGS TOPO MAPS

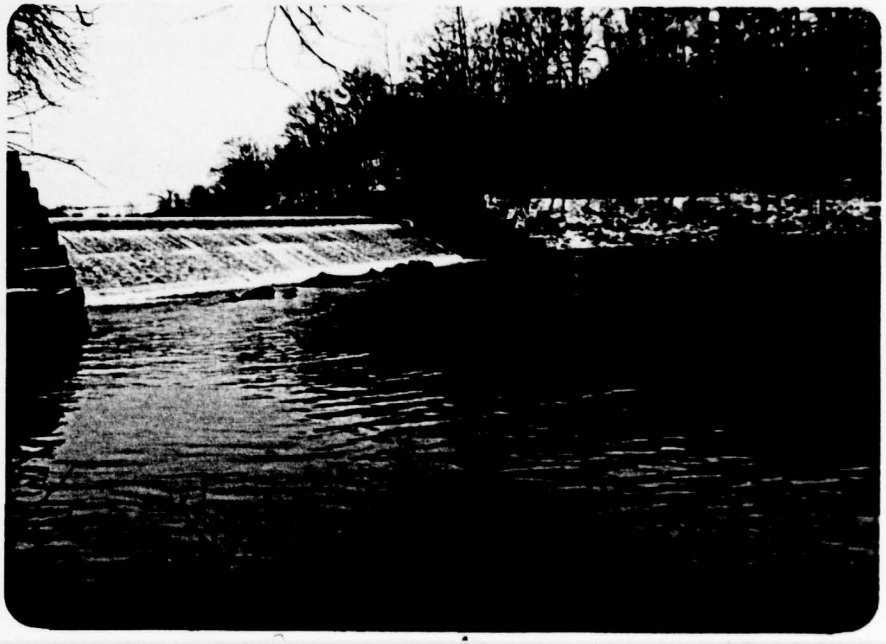
DOWNSTREAM ROUTING SECTIONS

APPENDIX D

PHOTOGRAPHS

1

2



APPENDIX D

PHOTOGRAPHS

PHOTOGRAPH 1 — View of the embankment to the right of the emergency spillway, as seen from the right abutment. Note the eroded and unprotected area along the upstream face.

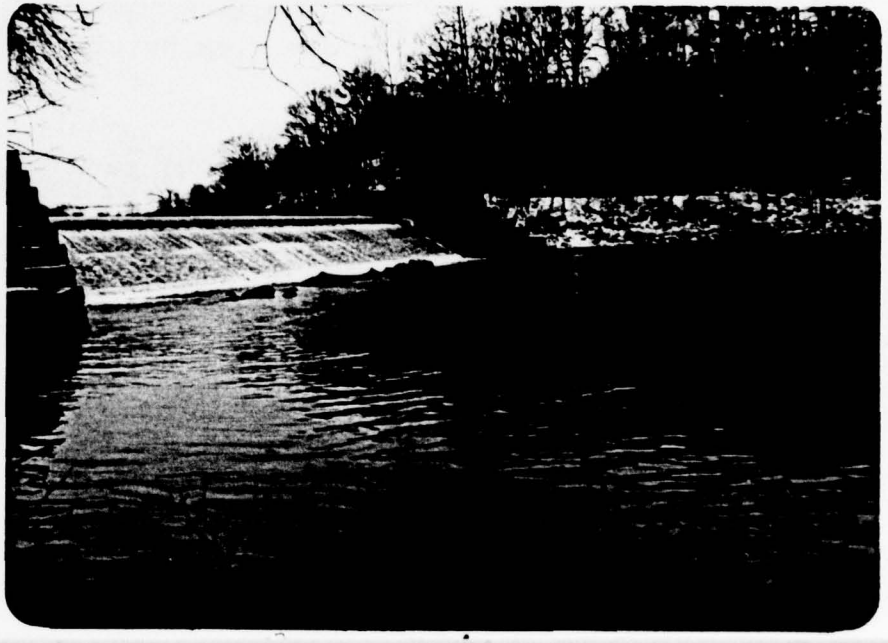
PHOTOGRAPH 2 — View of the emergency spillway looking toward the left abutment.

PHOTOGRAPH 3 — View of that portion of the embankment between the service and emergency spillways, as seen from the service spillway area.

PHOTOGRAPH 4 — Downstream view of the service spillway and left abutment.

1

2



PHOTOGRAPH 5 View of a typical section of the upstream embankment slope.

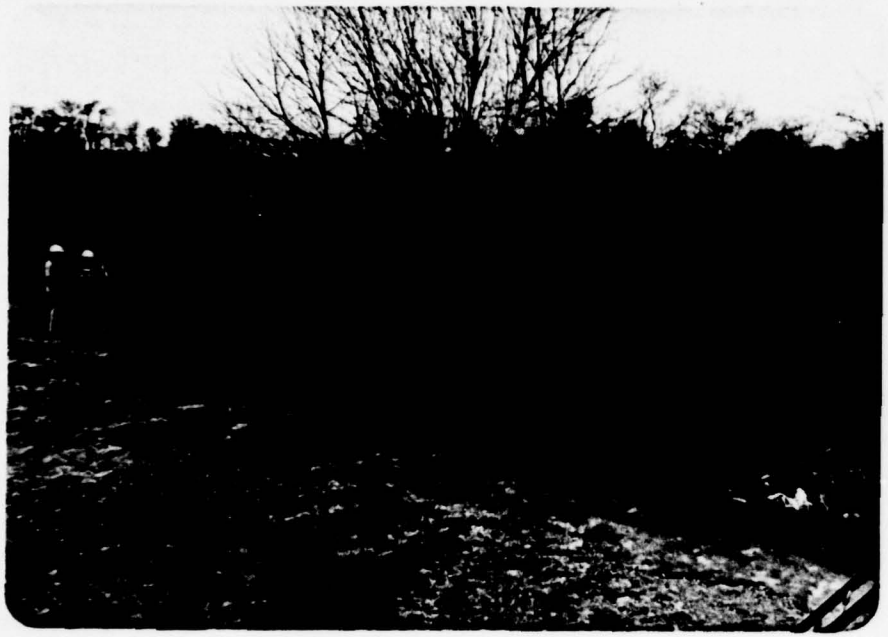
PHOTOGRAPH 6 View of the concrete retaining wall along the downstream slope of the embankment section between the two spillways. The wall extends to the right abutment but is interrupted by the emergency spillway.

PHOTOGRAPH 7 View showing the extent of overgrowth immediately beyond the emergency spillway.

PHOTOGRAPH 8 View of the deteriorated left concrete wingwall of the emergency spillway.

5

6



7

8

PHOTOGRAPH 9 View, from upstream, of the service spillway looking toward the left abutment. Note the badly spalled concrete wingwall.

PHOTOGRAPH 10 View from the service spillway looking downstream toward Lower Bridgeport Dam.

PHOTOGRAPH 11 View of several residences situated along the left shore of the Lower Bridgeport Reservoir.

PHOTOGRAPH 12 View of Lower Bridgeport Dam situated approximately 2,400 feet downstream from Upper Bridgeport Dam.

9

10

11

12

APPENDIX E

GEOLOGY

Geology[1]

The Upper Bridgeport Dam is located approximately 1.5 miles southeast of Mount Pleasant, Pennsylvania, within the Pittsburgh Plateaus Section of the Appalachian Plateaus Physiographic Province. The Pittsburgh Plateaus Section is characterized by flat-lying to very gently folded sedimentary rock strata of Pennsylvanian age. Major structural axes strike from southwest to northeast.

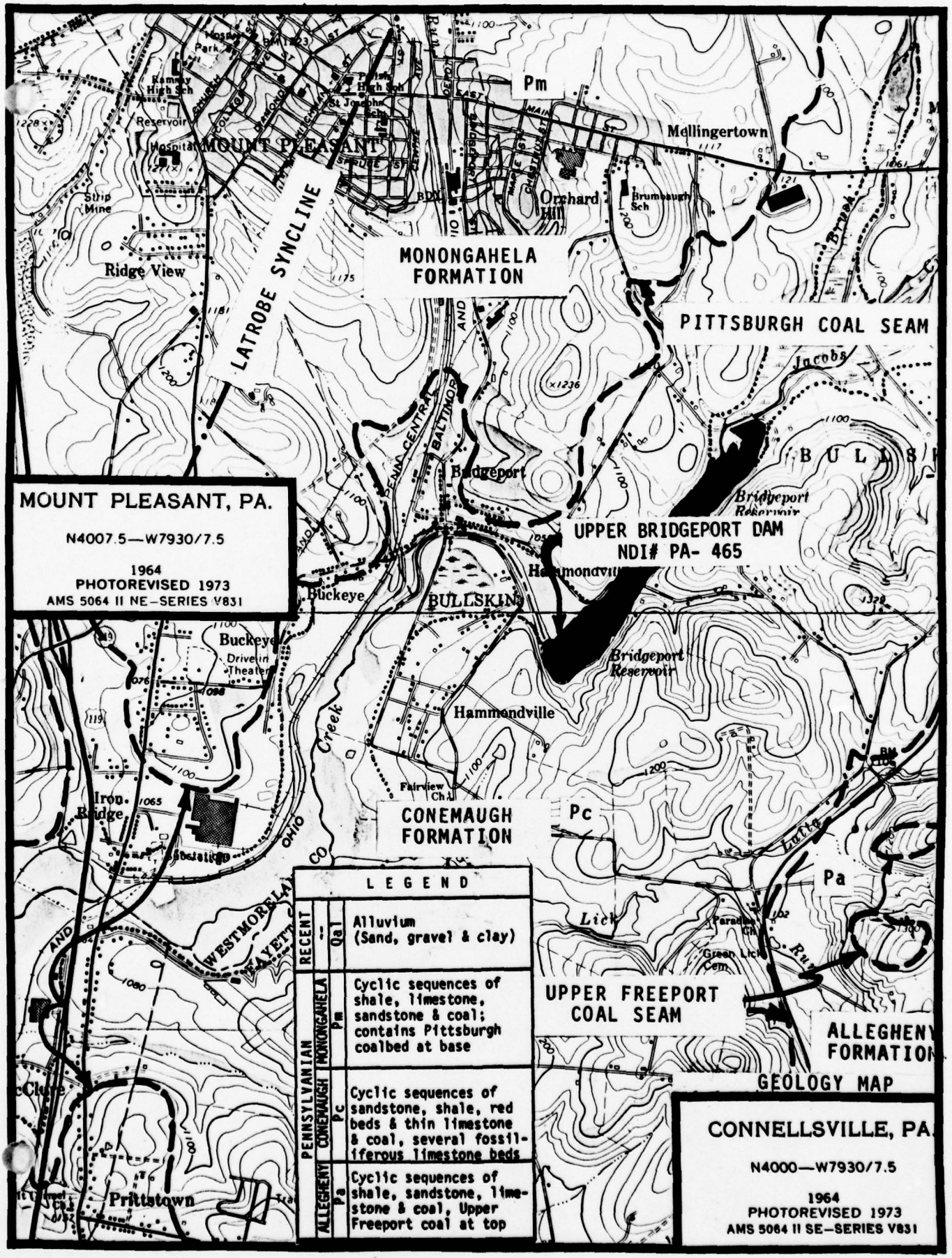
The dam site is located on the northwest flank of the Chestnut Ridge Anticline. The anticlinal axis strikes about N30°E and lies approximately 4 miles east of the dam site. Rock strata underlying the dam and reservoir dip to the northwest, at approximately 6 degrees, to a structural low elevation along the axis of the Latrobe Syncline.

Two major coal seams occur in the area. The Pittsburgh seam lies above drainage with respect to the dam and reservoir whereas the Upper Freeport seam lies approximately 400 to 500 feet beneath the dam and reservoir. The latter seam is currently not being mined in the immediate vicinity of the dam and reservoir.[2]

At the dam site, the Jacobs Creek floodplain is about 1,000 feet in width. The floodplain below the dam increases in width and is generally poorly drained. The valley is floored with moderate to thick deposits of alluvium consisting of clay, silt, sand, and gravel.

[1]Hickok, IV, W. O., and F. T. Moyer, "Geology and Mineral Resources of Fayette County, Pennsylvania," Harrisburg: Topographic and Geologic Survey, Bul. C-26, 1940.

[2]Dowd, James J., et. al., "Estimate of Known Recoverable Reserves of Coking Coal in Westmoreland County, Pennsylvania," U. S. Department of the Interior, Bureau of Mines, Report of Investigations 4803, January 1951.


Pm
MONONGAHELA FORMATION
LATROBE SYNCLINE
PITTSBURGH COAL SEAM
MOUNT PLEASANT
Mellingertown
Orchard Hill
Ridge View
Strip Mine
Bridgeport
Buckeye
BULLSKIN
Hammondville
Bridgeport Reservoir
UPPER BRIDGEPORT DAM
NDI# PA- 465
Buckeye Drive-in Theater
Iron Bridge
CONEMAUGH FORMATION
Pc
Pa
UPPER FREEPORT COAL SEAM
ALLEGHENY FORMATION
Prittstown
MOUNT PLEASANT, PA.
N4007.5—W7930/7.5
1964
PHOTOREVISED 1973
AMS 5064 II NE-SERIES V831
LEGEND
PENNSYLVANIAN
RECENT
Qal
Alluvium (Sand, gravel & clay)
ALLEGHENY
MONONGAHELA
Pm
Cyclic sequences of shale, limestone, sandstone & coal; contains Pittsburgh coalbed at base
CONEMAUGH
Pc
Cyclic sequences of sandstone, shale, red beds & thin limestone & coal, several fossiliferous limestone beds
Pa
Cyclic sequences of shale, sandstone, limestone & coal, Upper Freeport coal at top
GEOLOGY MAP
CONNELLSVILLE, PA.
N4000—W7930/7.5
1964
PHOTOREVISED 1973
AMS 5064 II SE-SERIES V831

APPENDIX F

FIGURES

LIST OF FIGURES

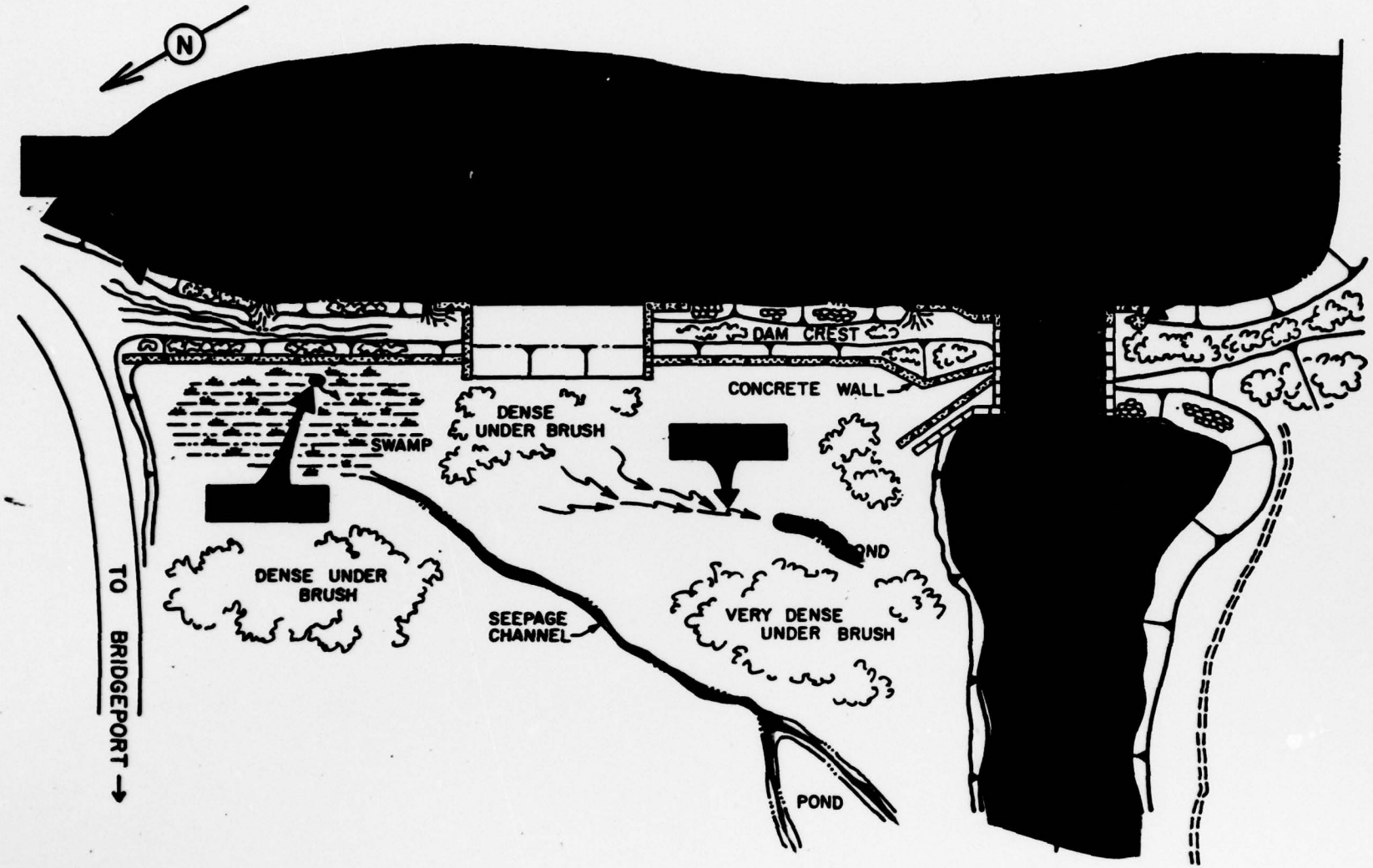
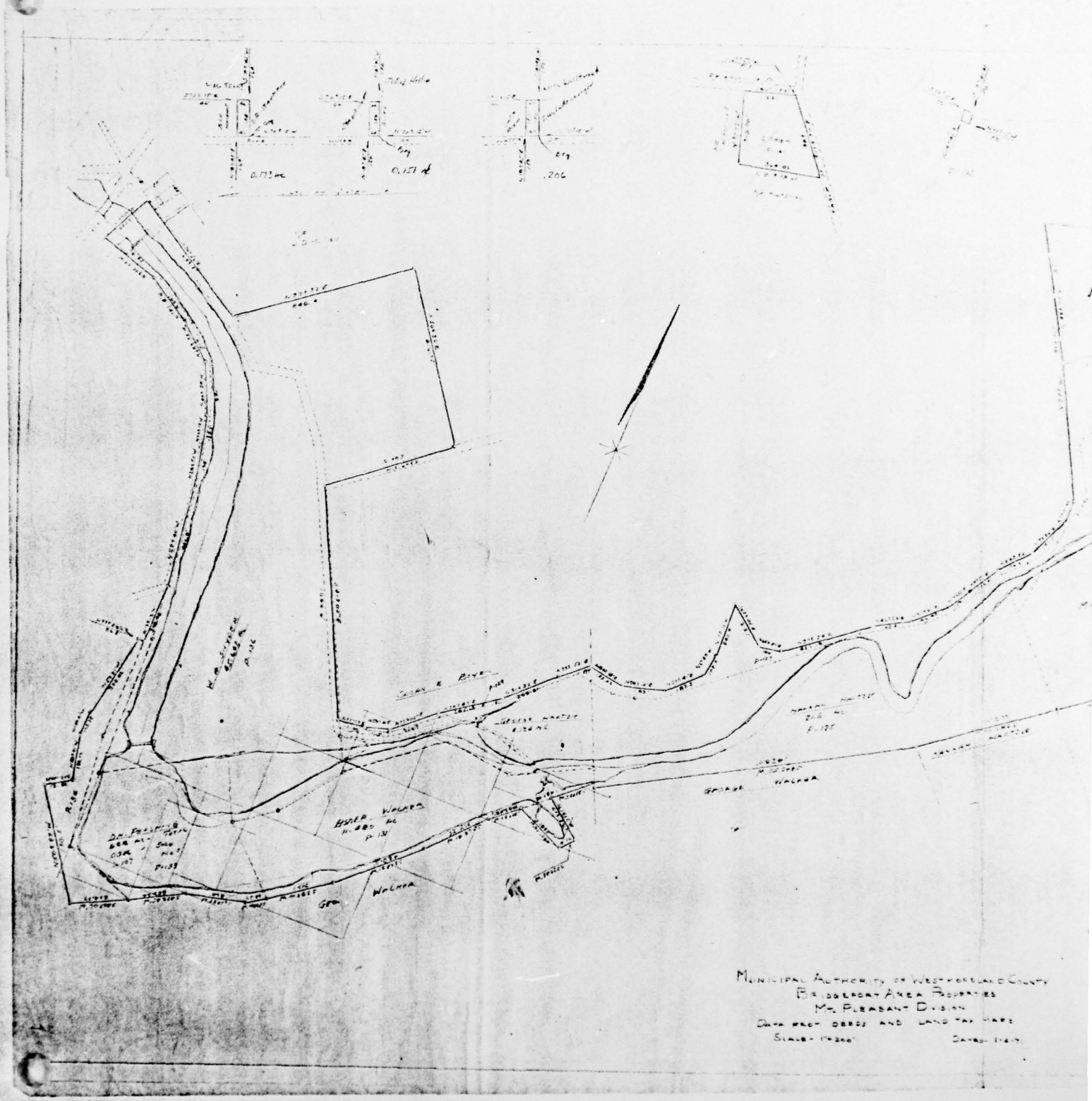


FIGURE 1 - UPPER BRIDGEPORT DAM
GENERAL PLAN
FIELD INSPECTION NOTES



MUNICIPAL AUTHORITY OF WESTMORELAND COUNTY
BRIDGE LOCAT AREA PROPERTIES
MT. PLEASANT DIVISION
DATA FROM DEEDS AND LAND TAX MAPS
SCALE- 1"=200' DATED- 1-6-71

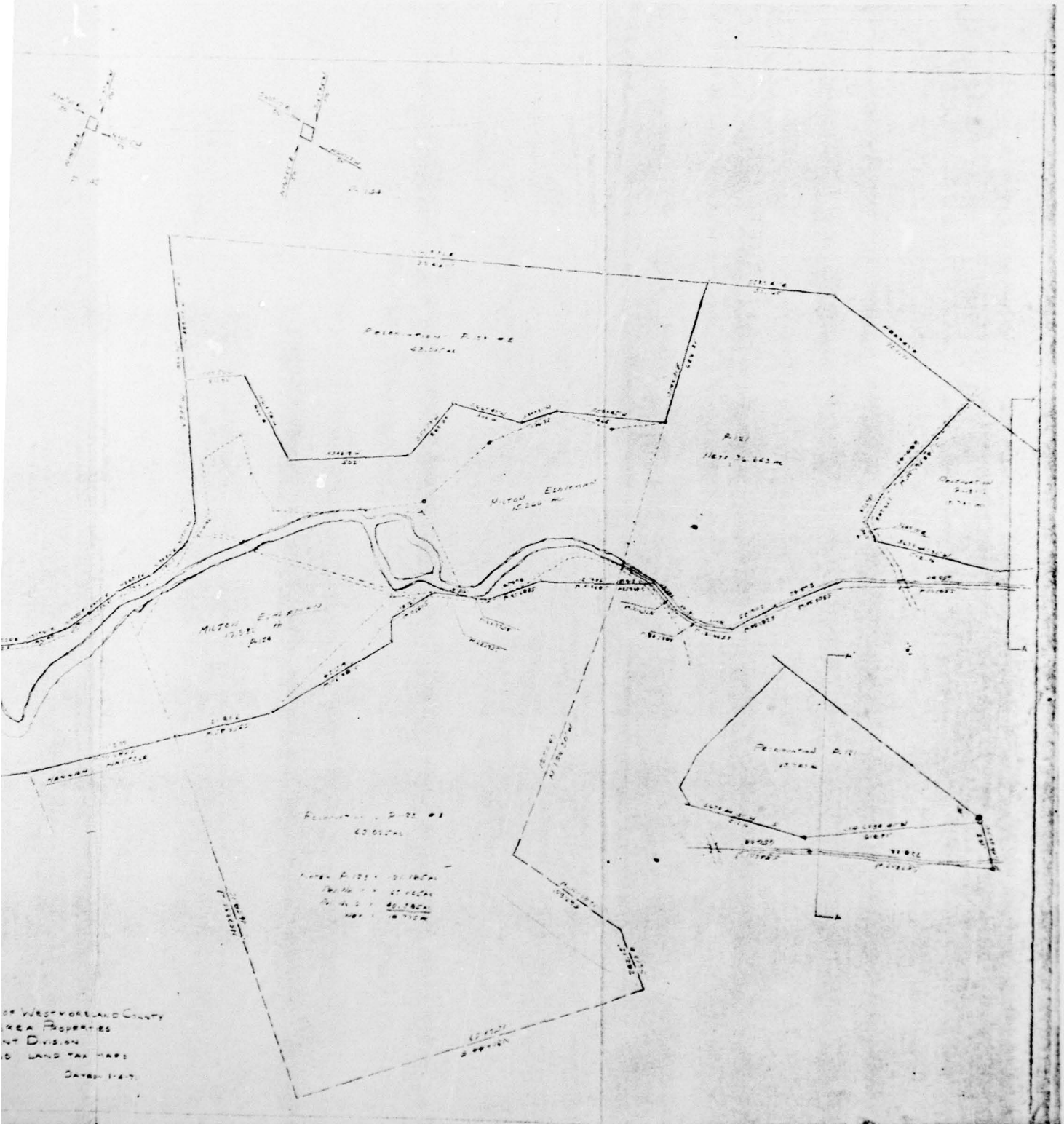
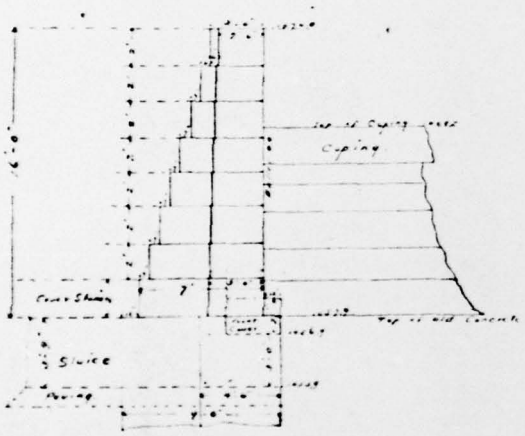
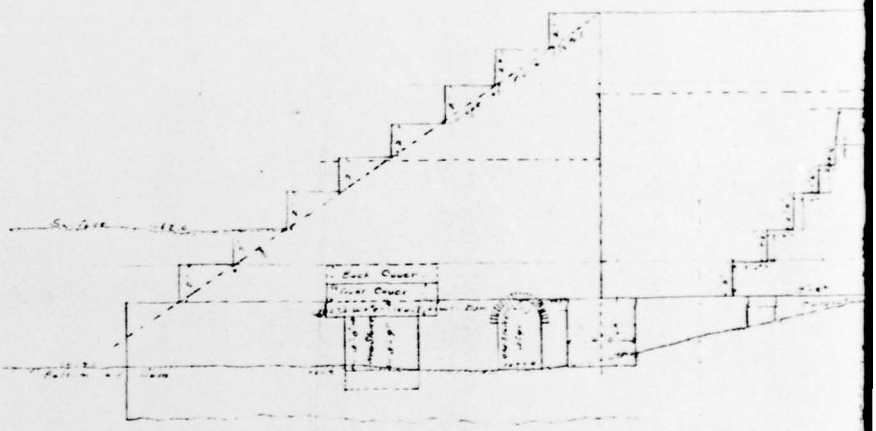


FIGURE 2

2

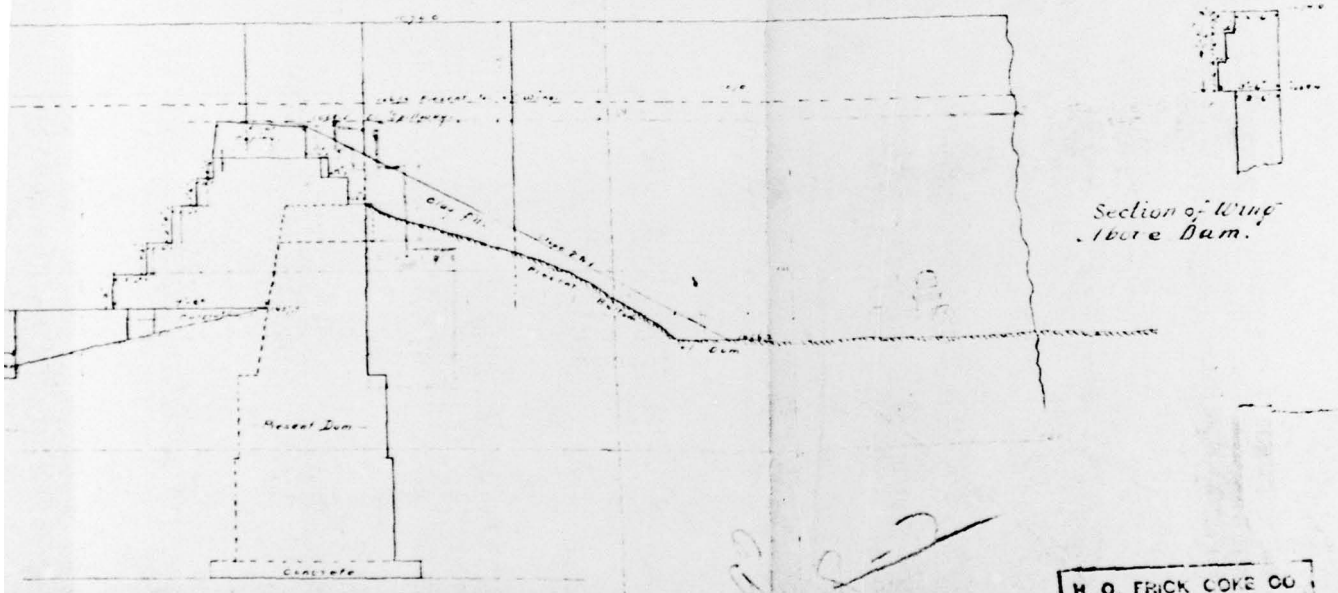


End View of
Wing Wall.



Plan for chanoing Wing Walls.
Upper Dam.
Mt. Pleasant Water Co.
Scale 1/4 in per foot.
Oct 21. 1884
H.L.A

Side Elevatio
Section o
(See pl

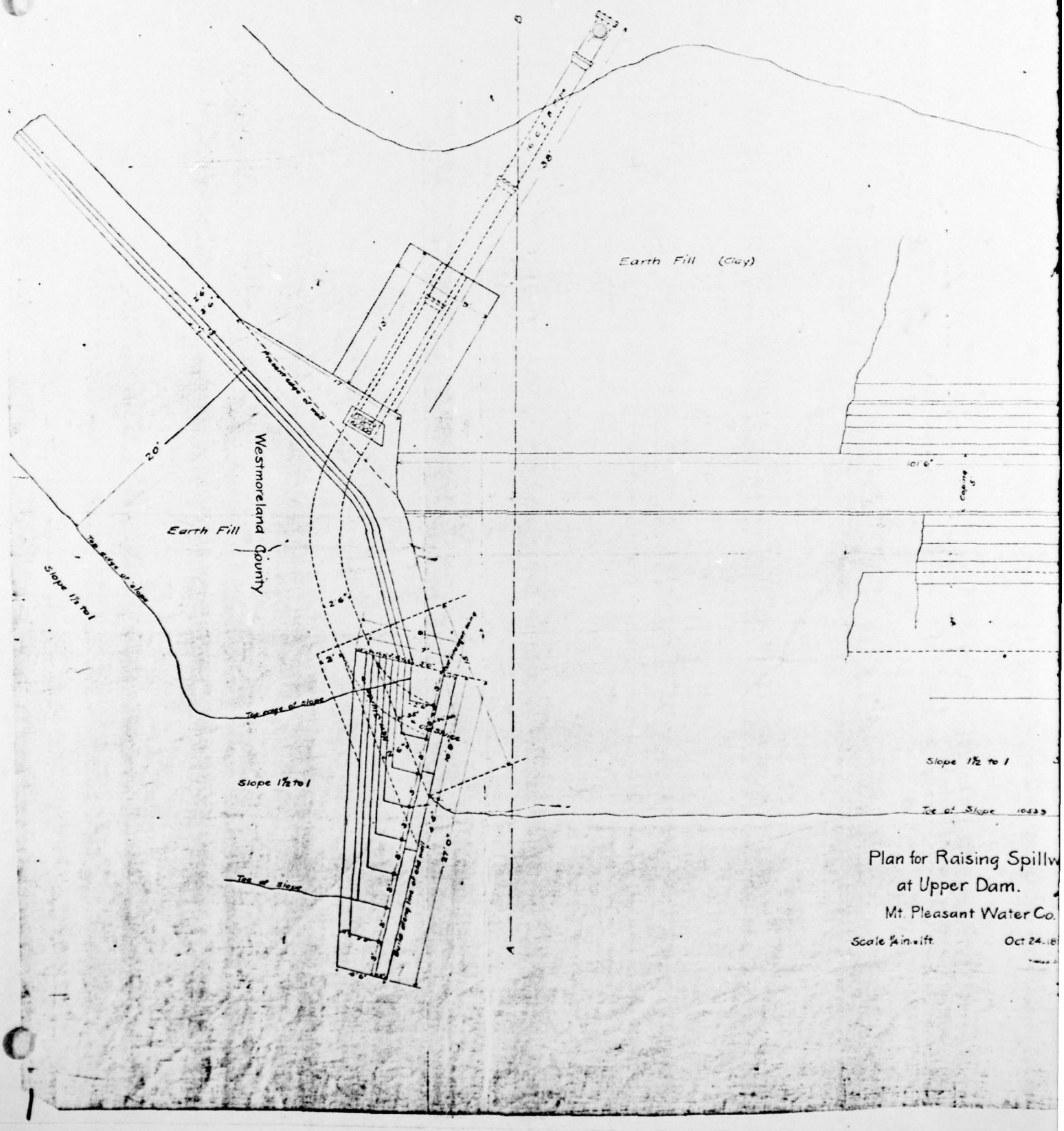


Side Elevation of Wing Wall, and Section of Dam on line A.B.
(See plan for raising spillway)

H. C. FRICK COKE CO
DRAWING No. 4
CAR "B" DRAWER 3

2

FIGURE 3


Earth Fill (Clay)
Westmoreland County
Earth Fill
Slope 1½ to 1
Top edge of slope
Slope 1½ to 1
Top edge of slope
Slope 1½ to 1
Toe of Slope
Toe of slope
Plan for Raising Spillw
at Upper Dam.
Mt. Pleasant Water Co.
Scale 1/4 in. = 1 ft.
Oct 24. 18

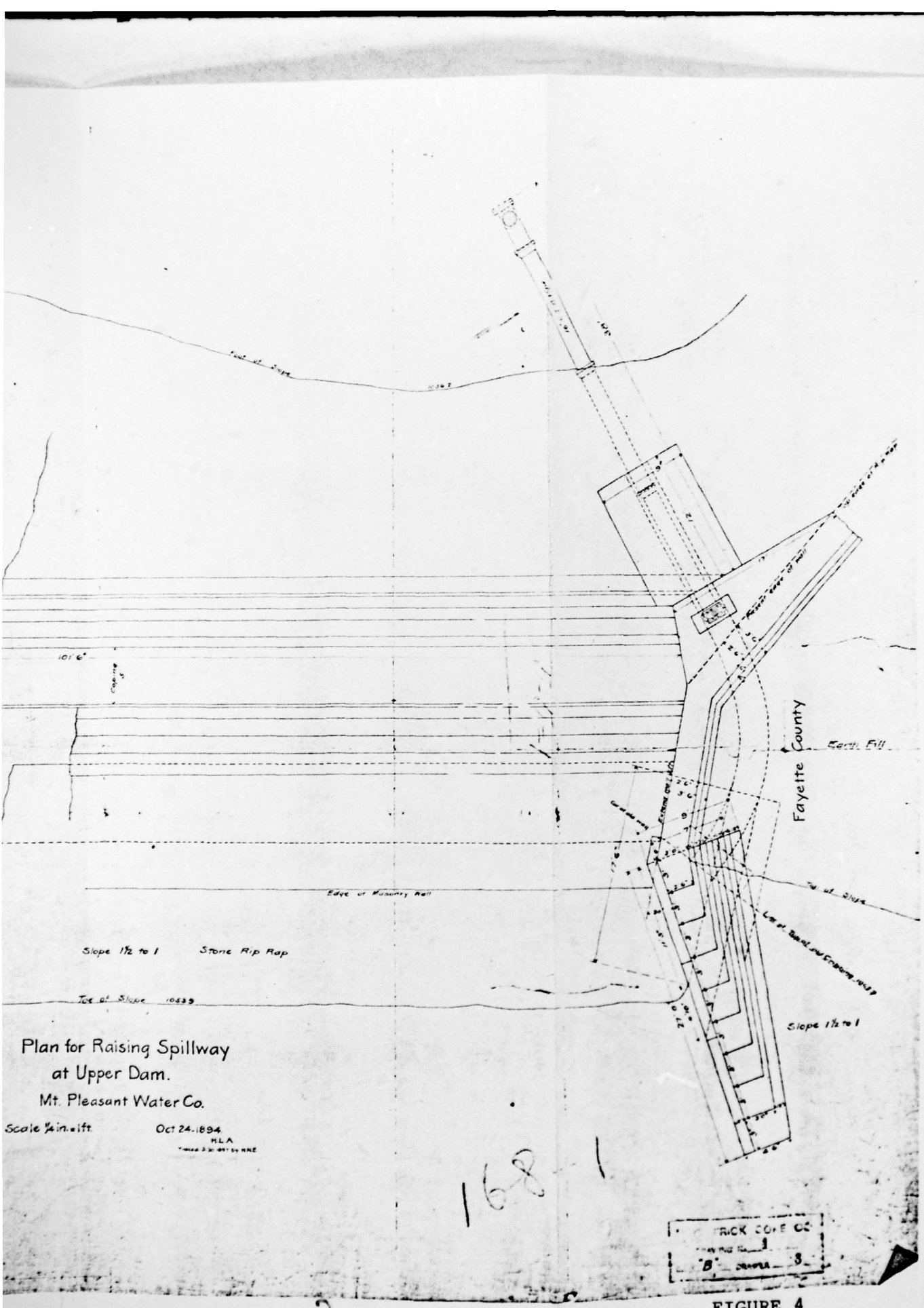
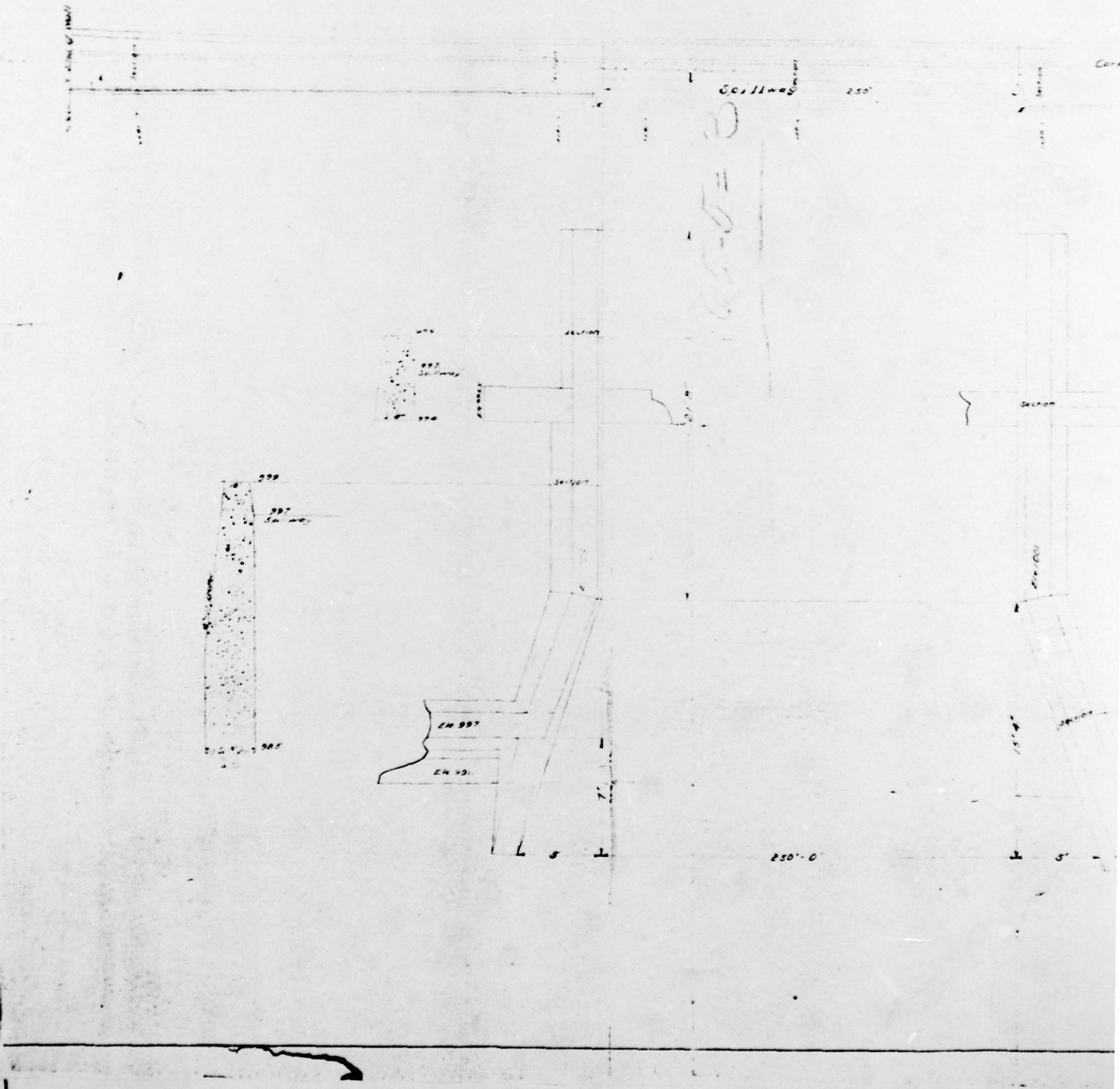

Fayette County
Earth Fill
Edge of Masonry Wall
Slope 1½ to 1
Stone Rip Rap
Toe of Slope 1063.9
Slope 1½ to 1
Plan for Raising Spillway
at Upper Dam.
Mt. Pleasant Water Co.
Scale ¼ in. = 1 ft.
Oct 24-1894
H.L.A.
1681
TRICK COPY CO.

FIGURE 4


250'
250'-0"
EL 997
EL 993

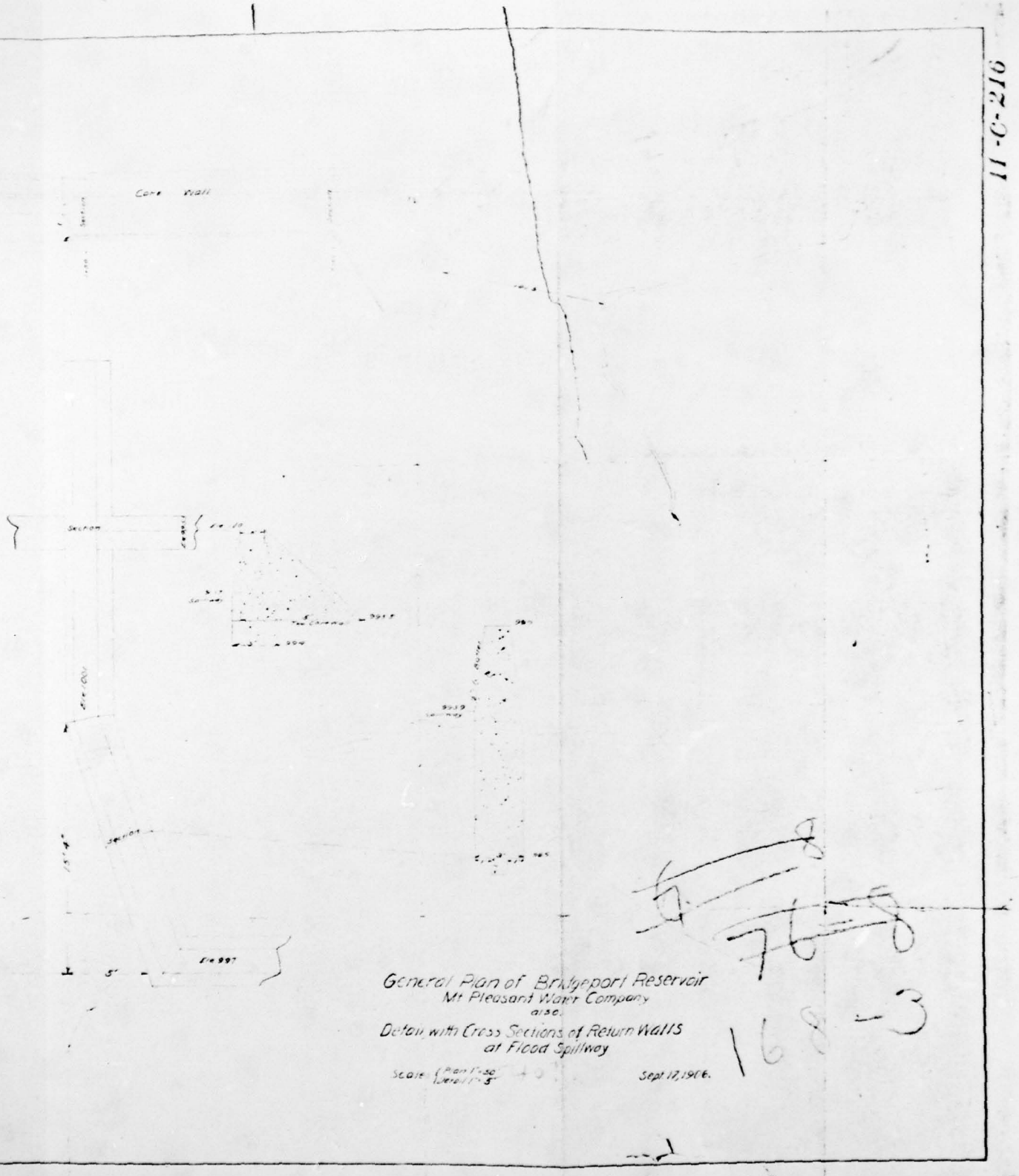
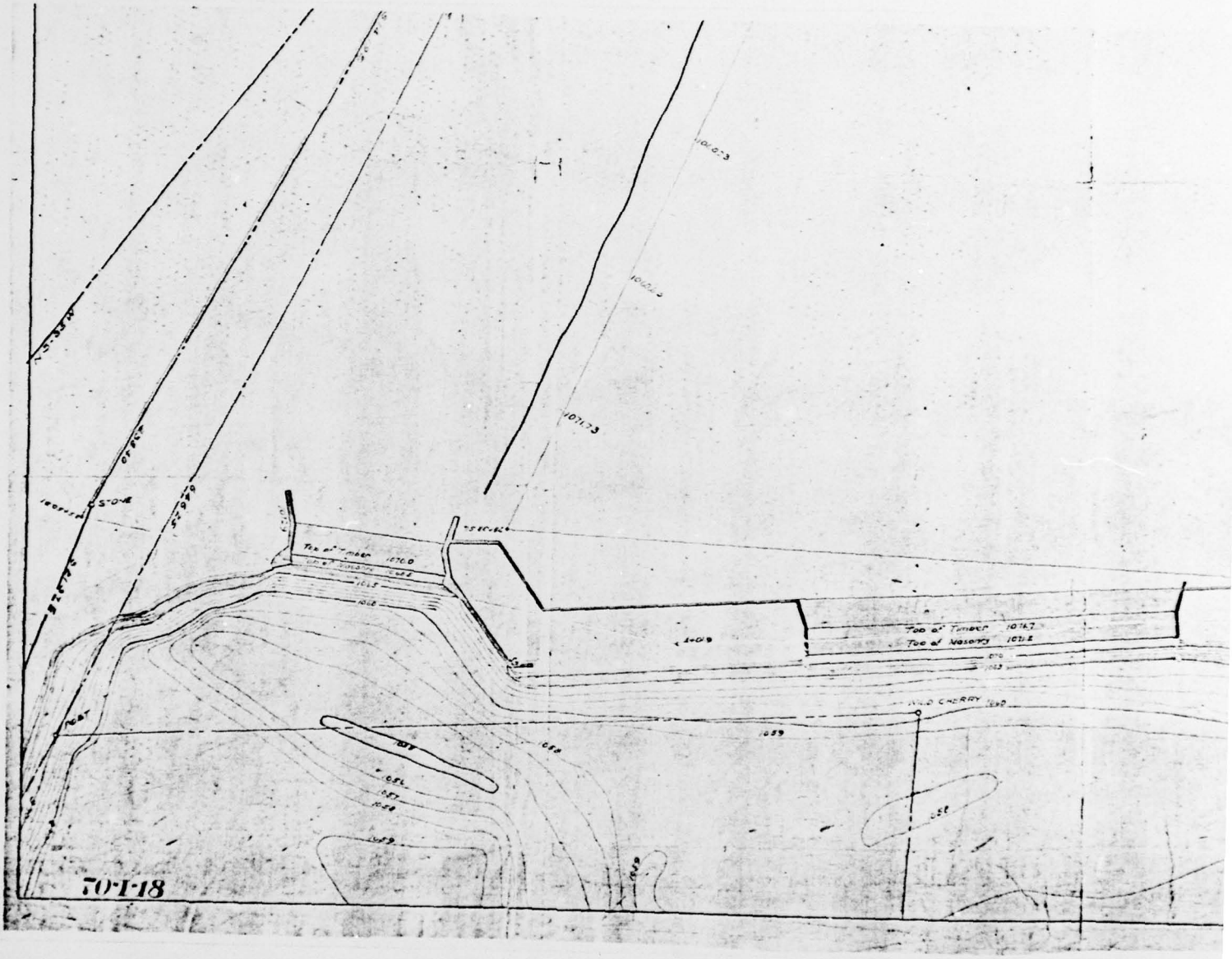
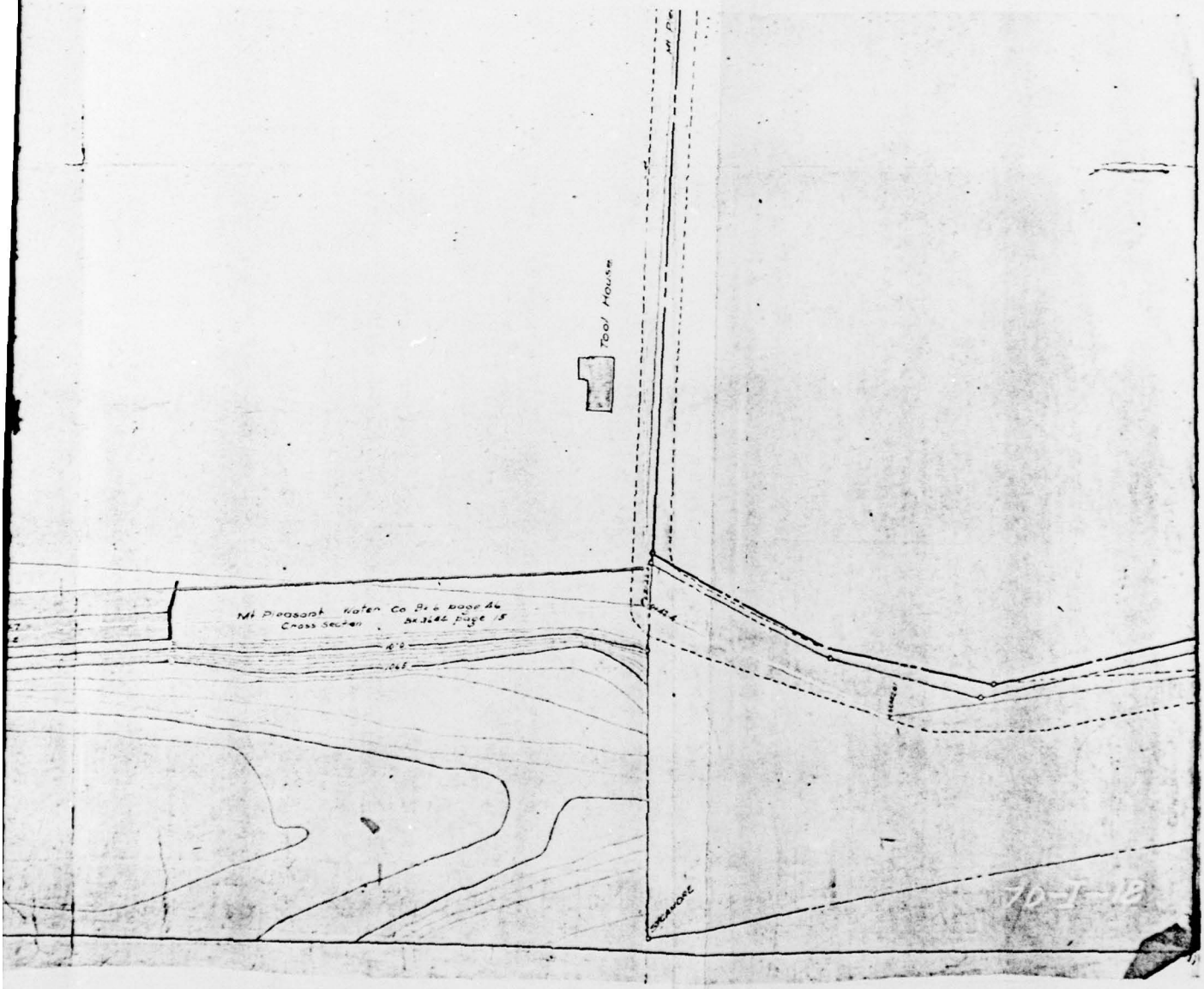

11-C-216
Core Wall
General Plan of Bridgeport Reservoir
Mt Pleasant Water Company
also
Detail with Cross Sections of Return Walls
at Flood Spillway
Sept 17, 1906.
7688
168-3

FIGURE 5


Top of Timber 1071.7
Top of Masonry 1071.8
WILD CHERRY
70-1-18

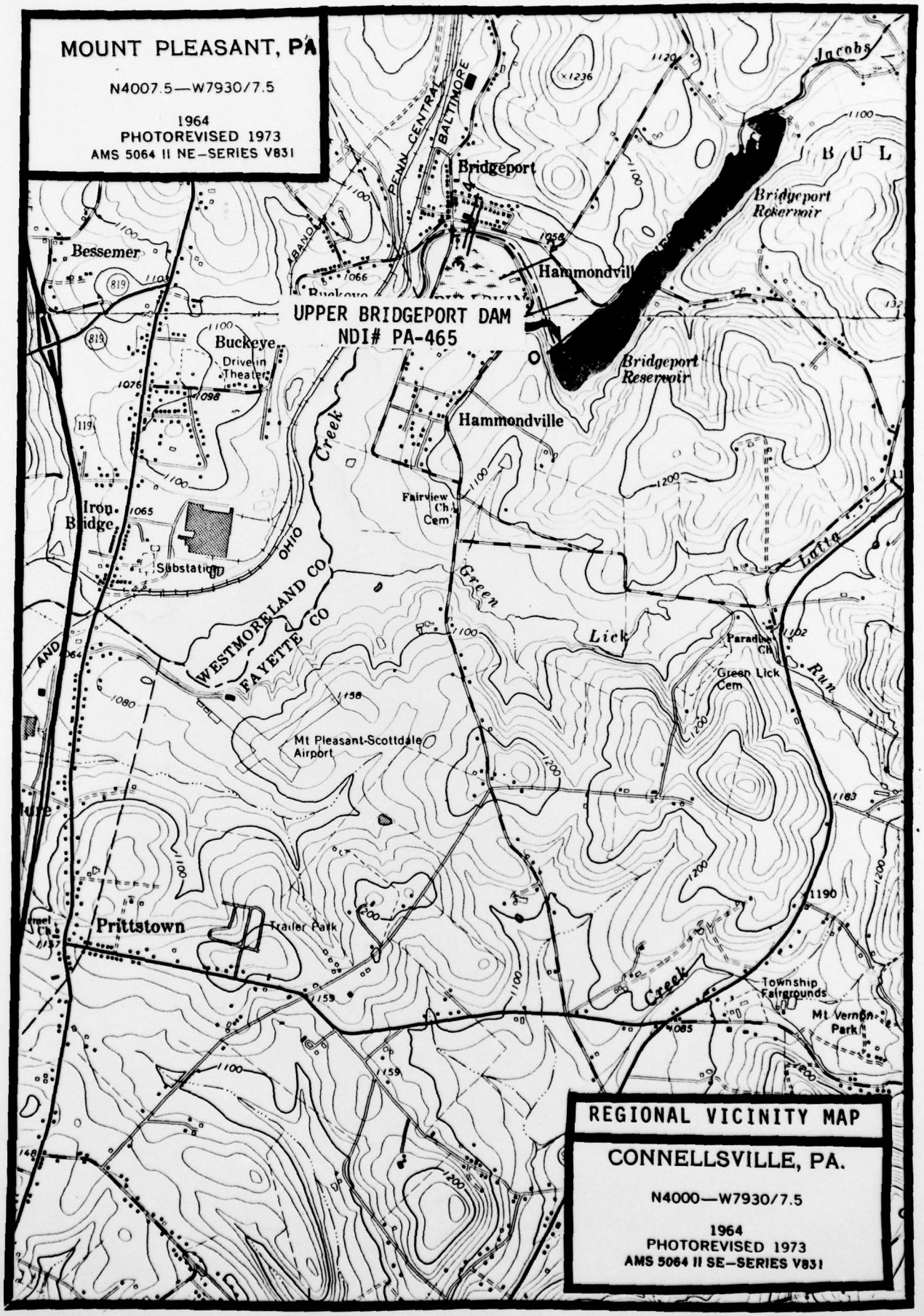

Tool House
Mt Pleasant Water Co Pt 6 Book 46
Cross Section
Bk 3284 Page 15
SYCAMORE

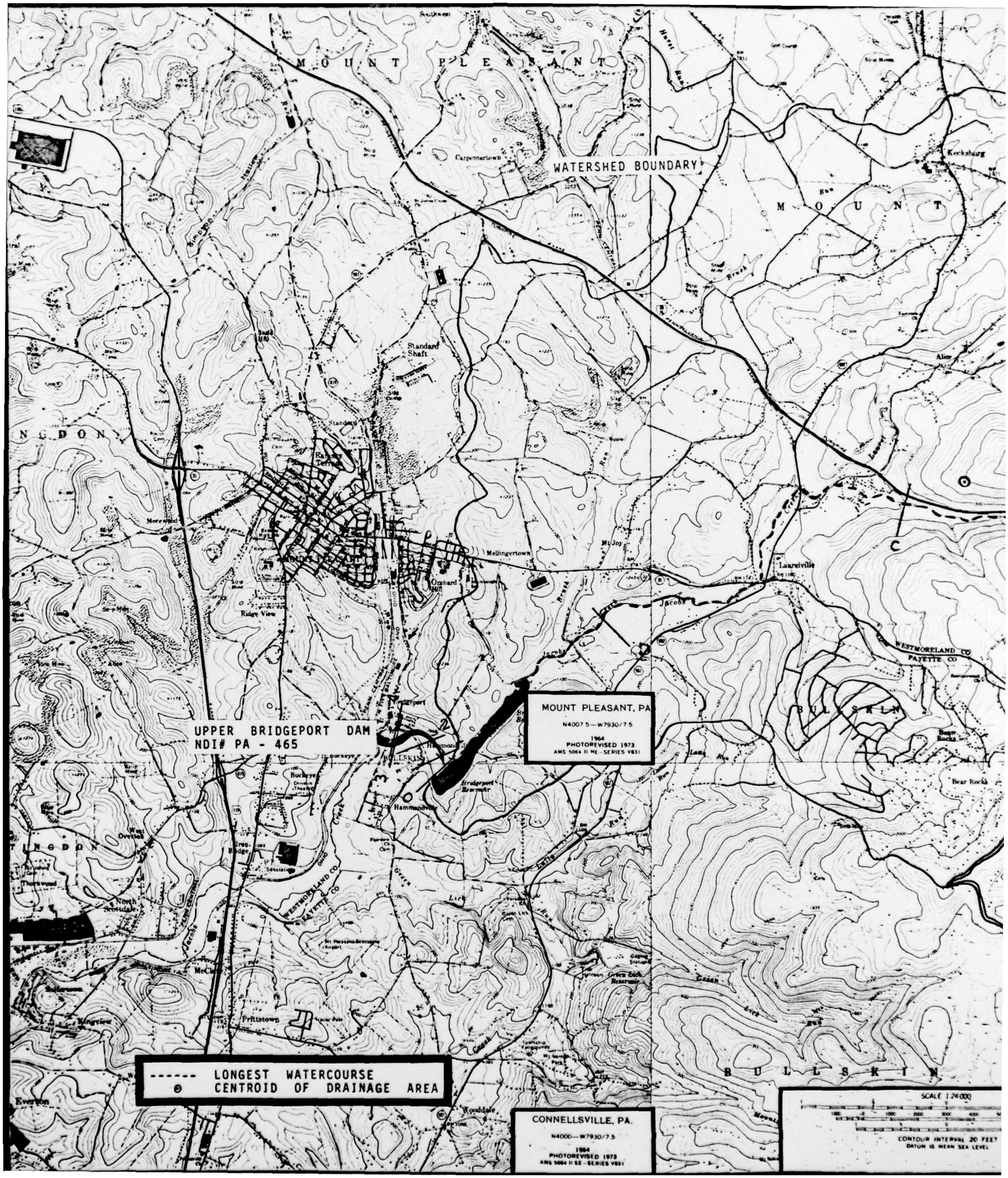
2.

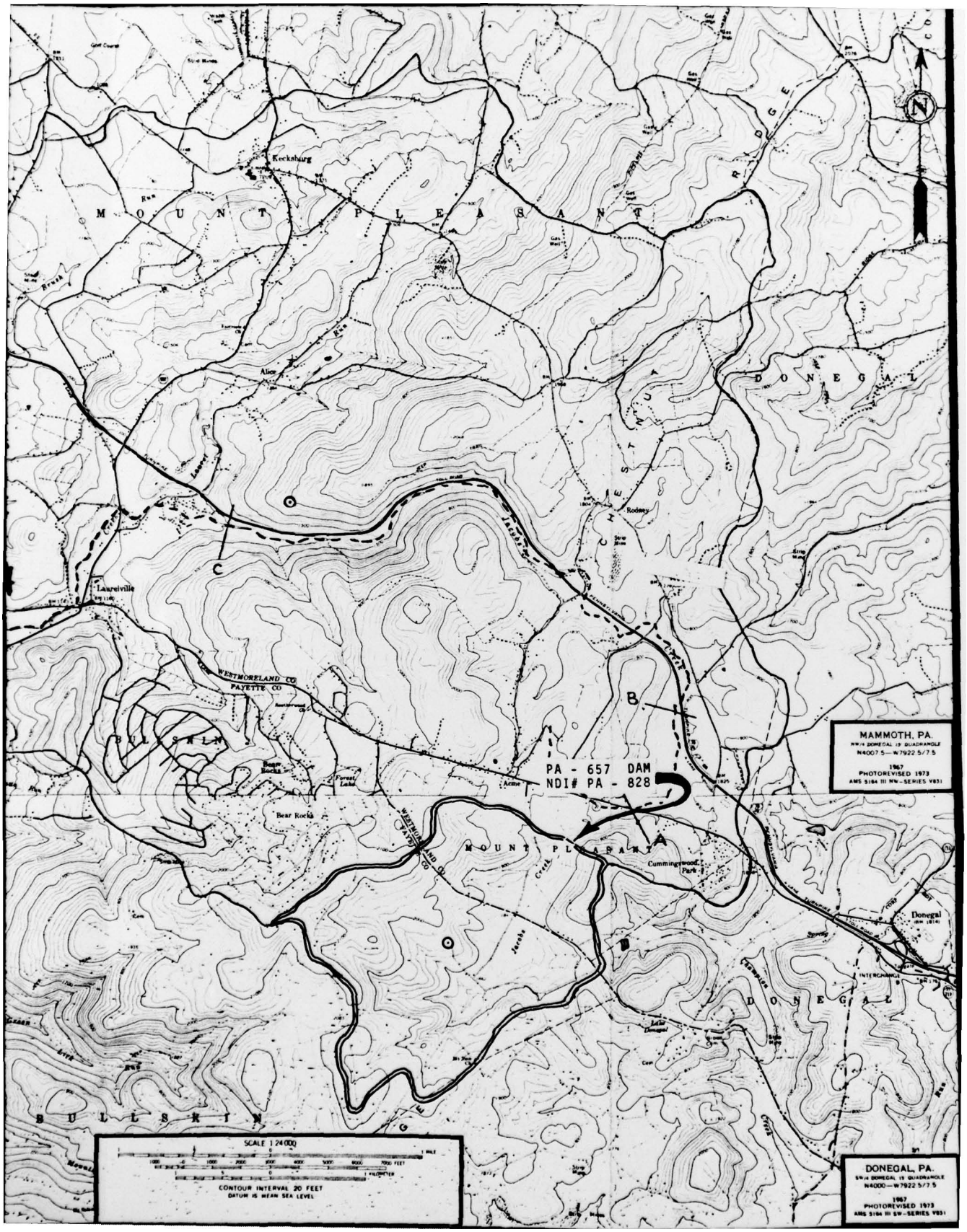
FIGURE 6

APPENDIX G

REGIONAL VICINITY AND WATERSHED BOUNDARY MAPS


MOUNT PLEASANT, PA
N4007.5—W7930/7.5
1964
PHOTOREVISED 1973
AMS 5064 II NE—SERIES V831
UPPER BRIDGEPORT DAM
NDI# PA-465
Bridgeport
Bessemer
Buckeye
Drive-in
Theater
Hammondville
Bridgeport
Reservoir
Jacobs
Creek
Iron
Bridge
Substation
Fairview
Ch
Cem
OHIO
WESTMORELAND CO
FAYETTE CO
Green
Lick
Run
Paradise
Ch
Green Lick
Cem
Mt Pleasant-Scottdale
Airport
Prittstown
Trailer Park
Township
Fairgrounds
Mt Vernon
Park
REGIONAL VICINITY MAP
CONNELLSVILLE, PA.
N4000—W7930/7.5
1964
PHOTOREVISED 1973
AMS 5064 II SE—SERIES V831


WATERSHED BOUNDARY
MOUNT PLEASANT
MOUNT
Kecksburg
Carpentertown
Standard Shaft
Mellingertown
Laurelville
Orchard
Ridge View
WESTMORELAND CO
FAYETTE CO
Bear Rocks
UPPER BRIDGEPORT DAM
NDI# PA - 465
MOUNT PLEASANT, PA
N4007.5—W7930/7.5
1964
PHOTOREVISED 1973
AMS 5064 II NE-SERIES V831
Hammondville
Bridgeport Reservoir
Prittstown
Everson
BULLSKIN
------ LONGEST WATERCOURSE
⊙ CENTROID OF DRAINAGE AREA
CONNELLSVILLE, PA.
N4000—W7930/7.5
1964
PHOTOREVISED 1973
AMS 5064 II SE-SERIES V831
SCALE 1:24000
CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL


PA - 657 DAM
NDI# PA - 828
MAMMOTH, PA.
1967
PHOTOREVISED 1973
DONEGAL, PA.
1967
PHOTOREVISED 1973
SCALE 1:24000
CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL
Keckshurg
Alice
Laureiville
Rodney
Acme
Bear Rocks
Cummingwood Park
Donegal
WESTMORELAND CO
FAYETTE CO
M O U N T P L E A S A N T
C H E S T N U T R I D G E
D O N E G A L
B U L S K I N